Carroll County Maryland

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM
MUNICIPAL SEPARATE STORM SEWER SYSTEM
DISCHARGE PERMIT

2018 ANNUAL REPORT

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Carroll County

NPDES ANNUAL REPORT

2018

CARROLL COUNTY, MARYLAND
NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)
MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4)
PERMIT

Preface

This document summarizes Carroll County, Maryland's compliance efforts taken in response to conditions attached to the National Pollutant Discharge Elimination System Permit No. 11-DP-3319 (MD0068331) issued for the County's municipal storm sewer systems. Permit No. 11-DP-3319 is required under Section 1342 (p) of the Clean Water Act (ref.: USC, Title 33, Ch. 26, Sub. Ch. IV). It is in response to the specific requirements in 40 CRF122.42(c). This report provides documentation under Carroll County's fourth generation permit from July 1, 2017, through June 30, 2018.

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MDE 2017 Annual Report Assessment Response

ATTACHMENT 1

This section of the annual report addresses documentation received from the state regarding MDE's Assessment and Recommendations related to the previously submitted 2017 Annual Report. Therefore, the response to comments from the assessment is focused on the reporting period July 1, 2016 to June 30, 2017. The November 2, 2018 assessment documentation included in Attachment 1 provided comments related to the reporting period as found in the submitted annual report. The following is a discussion, presented by permit condition, related to issues which were identified within the assessment.

Source Identification

Response to comments related to incomplete entries in the geodatabase associated with BMP costs:

Where the County has reported no cost with the Alternative and Restoration BMP record the comment field has been populated with a reason. Those BMP's which have cost have been shown with a fully extended amount. The IMPL _ cost field for the Alt BMP line feature class has been included in the General Comment field.

Illicit Discharge Detection and Elimination (IDDE)

Response to comments regarding the MDE November 29, 2017 audit: "required in the next annual report include updates on the County's efforts to refine the storm sewer system map; continued reporting on training activities, education initiatives, and collaboration with incorporated municipalities; and updates to the standard operating procedures if applicable."

On November 29, 2017, MDE conducted a field audit of the County's IDDE program. MDE issued a letter dated February 12, 2018 commending the County for its commitment to implementing a successful program finding the County in compliance with Part IV.D.3 of the permit. Informational reporting and updates typically provided in the annual report were required per the audit letter and are addressed in the applicable written narrative sections of the 2018 annual report. Standard operating procedures remain unchanged at this time.

Response to comments regarding the MDE November 29, 2017 audit: MDE also requested that the County evaluate whether expanding the surveyed commercial and industrial areas would add potential significant polluters to the County's inventory. These surveys provide the opportunity to discover pollution closer to the source.

1) The current MS4 Permit, Part IV. C. Source Identification Item 2. Industrial and Commercial Sources states *"the permittee is required to identify "industrial and*

commercial land uses and sites that the County has determined have the potential to contribute significant pollutants".

The County's NPDES Team developed a methodology reported in the 2015 MS4 Annual Report to determine site selection for conducting IDDE Visual Surveys. The methodology focused on potential pollutant exposures closest to mapped streams. A buffer of 300 feet was placed on the streams to select properties. Given the stream system upland patterns in the County and typical business locations, we believed this would identify a majority of commercial/industrial areas that could potentially contribute significant pollutants to the MS4. This process generated 232 potential sites with an aggressive plan to survey all by the end of the 5 year permit term.

Per MDE's request, an evaluation to expand the inventory was performed. A preliminary desktop analysis using basically the same criteria as the current methodology but excluding the stream buffer component indicates the approximate number of properties to be between 300 and 360 properties. Carroll County intends to evaluate its entire IDDE Visual Survey program at the end of the 5 year permit term. This assessment will consider adjustment to selection criteria for the inventory as well as survey procedures for efficiency and effectiveness. Carroll County will report on the result in the 2019 Annual Report.

Response to comments regarding the MDE November 29, 2017 audit: "provide an update on the use of the draft visual survey inspection form and provide an example. This information must be submitted in the next annual report".

IDDE Visual Survey Inspection Form

2) An update on the use of the visual survey inspection form is discussed in the 2018 Annual Report section Part IV.D.3 Illicit Discharge Detection and Elimination with an example posted in the appropriate Appendix. It has been effective.

Restoration Plans and TMDL

Response to comments regarding septic pumping and a requirement to include property address in order to claim credit:

Currently the County acquires the total annual gallons accepted by the Carroll County owned, City of Westminster operated septage pre-treatment facility. The total annual gallons of household septage is converted to households (≈ 1,000 gallons/household). The number of households is then multiplied by .03 to derive impervious acre equivalent (per the 2014 Stormwater Accounting document). The impervious acre equivalent is used only for impervious mitigation, not watershed nutrient reduction.

There is no requirement in the Stormwater Accounting document for the collection of address data. The gallons received and treated at the facility are accurately recorded. Therefore the need

to acquire address data, which would entail a significant administrative effort does not appear to be necessary or provide any relative data.

TMDL Compliance

Response to comments regarding TMDL data in the MS4 Geodatabase:

The completion of tables associated with TMDL data has been initiated but cannot be completed as the County's restoration plans have not been finalized with MDE.

Response to comments regarding annual TMDL assessment report:

A more robust description of the County's efforts related to TMDL assessments has been provided in the 2018 Annual Report. Detailed data related to progress and changes in pollutant load reductions associated with local and Bay TMDL efforts is included in Appendix F. The County will continue to track and report progress as well as funding planned for continuing TMDL efforts. Implementation schedule and associated load reductions are provided through the current County Community Investment Program (CIP), which is based on a permit not yet released or issued. The County stands firm that it is fiscally not feasible to list or identify projects, benchmarks, or deadlines that have not been vetted or approved beyond the current CIP. This in no way negates or diminishes the County's efforts both historically or in the planned CIP related to TMDL progress.

Executive Summary – Carroll County NPDES MS4 (11-DP-3319 MD0068331) 2018 Reapplication Request

The following summary serves as Carroll County's reapplication to its NPDES MS4 Permit 11-DP-3319 MD0068331, as required per Part V. C. of the current permit. The current permit's expiration date is December 29, 2019. The information provided as part of this executive summary covers activity from December 29, 2014 to June 30, 2018.

1. Carroll County and its municipal co-permittees have a strong commitment to aggressively and consistently pursue measures which will improve water quality and work toward compliance with the NPDES MS4 permit. This commitment between the County and its municipal partners has been memorialized in a Memorandum of Agreement (MOA) signed October 23, 2014. This strong partnership between the County and municipalities provides for a seamless watershed based approach to water quality improvements while establishing strong coordination, fiscal allocations, and a unified commitment to success.

2. Results related to success and permit compliance are summarized below and represent efforts current as of June 30, 2018:

a) Illicit Discharge Detection and Elimination (IDDE)

- 300 NPDES Outfall Study Points
- 412 outfalls screened; 103 average/permit year
- 60% County/40% municipal across 7 watersheds
- County MS4 IDDE Guidance Manual developed
- Annual inspection staff training
- IDDE enforcement processed and tracked electronically through Accela software
- 4 confirmed Illicit Discharges Identified and Eliminated (1% of outfalls screened)
- MDE IDDE Audit November 2, 2017; Program found in compliance per correspondence February 12, 2018.

b/c) The County's current watershed restoration plans are still under review by MDE. This in no way has reduced implementation efforts. In fact the County is aggressively pursuing impervious restoration projects as reflected in mitigation totals as of June 30, 2018. Carroll County, including the municipalities, have approximately 16,144 total impervious acres. The total number of acres controlled by stormwater management (exclusive of permit mitigation) is 5,289 acres. In addition there are 2,097 non-county impervious acres. This results in a total untreated impervious acre count of 8,758 acres. The June 30, 2018 total acres related to water quality improvement projects and practices is 2,323 acres (includes 10% previous permit requirement and 20% existing permit requirement). This year's annual report (2018), of which this request is included, provides specific work projects and practices completed toward meeting stormwater impervious surface mitigation and associated nutrient

reductions (**Table 2)**. Nutrient reduction associated with the impervious surface mitigation provides progress toward meeting Stormwater Wasteload Allocations (WLAs) during the 4th Generation permit term. The following summary provides progress to date:

- Watershed Restoration Efforts as of June 30, 2018 have achieved 23,729 lbs. of Nitrogen, 1,550 lbs. of Phosphorus and 407 tons of sediment reductions.

- Progress toward achieving the Bay TMDL WLA from 2010 baseline includes; Potomac – 5.16%, Gunpowder – 8.81%, and Patapsco – 42.1% watersheds for Nitrogen. Progress toward achieving Phosphorus WLAs includes; Potomac – 4.45%, Gunpowder – 12.84%, and Patapsco – 22.84% watersheds.

- Progress toward achieving local TMDL WLA for Nitrogen includes; Double Pipe Creek – 2.5%, Liberty – 25.6%, Loch Raven – 174%, Lower Monocacy – 1.7%, Upper Monocacy – 20% and Prettyboy – 11.3% watersheds. Progress toward achieving sediment WLAs includes; Double Pipe Creek – 9.2%, Liberty – 26.8%, and Upper Monocacy – 3.9% watersheds.

It is clear the County is making progress in all watersheds associated with restoration plan implementation and impervious surface mitigation. Efforts related to impervious surface mitigation resulting in nutrient reductions toward WLA's are extremely time consuming, staff intensive, fiscally challenging and administratively burdensome. Progress should thus be measured or anticipated in terms of decades and not years so as to not set expectations which will result in unsuccessful outcomes.

Overall specific pollutant reduction achieved as a result of this permit can be found in Appendix F of this Annual Report (2018). Reductions are reported as a percent toward approved TMDL, as well as yearly progress. Projects and practices associated with permit compliance work are exhibiting positive progress toward achieving local stormwater WLAs.

d) The County's current baseline as described on page 13 of the 2018 Annual Report is 8,070 acres. The County therefore is required to mitigation the equivalent of 1,614acres of the baseline. As of June 30, 2018 a total of 1,634.8 acres have been mitigated. Therefore the County has achieved 101% of the required 20% permit requirement. Approximately 500 additional acres are planned to be under construction or completed by the end of 2019 4th Generation (permit term).

e) The recently received 2017 Annual Report evaluation provides positive confirmation related to other components of the permit. The review process flagged the TMDL assessment section which has been improved upon with the submittal of the 2018 Annual Report. Carroll County staff and municipal partners have worked extremely hard toward compliance throughout this permit term and the positive results are reflected in MDE's evaluation.

3. The County and its municipal partners are extremely proud of the fiscal commitment memorialized in the Memorandum of Agreement (MOA) which was initiated at the onset of this permit. The municipalities provide funds toward capital costs associated with impervious surface mitigation. The remaining capital and total operating expenditures are funded by the County. The commitment by the Carroll County Board of Commissioners has been consistent and strong throughout the permit term. Total expenditures for this permit term through June 30, 2018 is $34,331,808. These expenditures include $9,447,753 for operating expenses and $24,884,055 in capital improvement costs.

4. Overall the County and its municipal partners are very proud of the permit compliance achieved thus far with the current 4th Generation permit. The success in funding, impervious mitigation, and programmatic advances have been very rewarding. Therefore Carroll County and its co-permittees have developed and maintained a program which is comprehensive, effective and continues to work aggressively toward compliance with the goals and objectives of the permit.

Part I. Identification

A. Permit Number

11-DP-3319 (MD0068331)

B. Permit Area

This permit covers all stormwater discharges from the municipal separate storm sewer systems (MS4) owned or operated by Carroll County, Maryland (permittee), and the following incorporated municipalities: the Towns of Hampstead, Manchester, Mount Airy, New Windsor, Sykesville, Union Bridge and the Cities of Taneytown and Westminster (co-permittees).

C. Effective Date

December 29, 2014

D. Expiration Date

December 28, 2019

Part II. Definitions

Terms used in the Carroll County permit are defined in relevant chapters of the Code of Federal Regulations (CFR) or the Code of Maryland Regulations (COMAR). Terms not defined in CFR or COMAR shall have the meanings attributed by common use, unless the context in which they are used clearly requires a different meaning.

Part III. Water Quality

The permit requires all permittees to manage, implement, and enforce a stormwater management program (SWMP) in accordance with the Clean Water Act (CWA) and corresponding stormwater National Pollutant Discharge Elimination System (NPDES) regulations. According to Maryland Department of the Environment's (MDE) "Basis for Final Determination to Issue Carroll County's NPDES MS4 Permit," the goals of Carroll County's MS4 permit are to control stormwater pollutant discharges and unauthorized discharges into the MS4, to improve water quality within the County's urban watersheds, and to work toward meeting water quality standards (WQS).

In alignment with these goals, 402(p)(3)(B)(iii) of the CWA requires the County to implement "…controls to reduce the discharge of pollutants to the maximum extent practicable, including management practices, control techniques and systems, design and engineering methods, and such other provisions as the administrator or state determine appropriate for the control of such pollutants." Carroll County and its co-permittees have aggressively and consistently pursued

measures to improve water quality and work towards compliance with its NPDES MS4 permit, effectively prohibiting pollutants in stormwater discharges or other unauthorized discharges into the MS4.

The County fully supports its stormwater program through strong fiscal commitments, adequate staffing resources, and coordination between co-permittees. The County's fiscal expenditures and capital budgeting – historically, currently, and planned – demonstrate the implementation of this commitment. Achieving the impervious mitigation goal of this permit shows the County's aggressive implementation toward meeting these goals. Extensive public outreach efforts and interjurisdictional coordination between co-permittees to address mitigation, stormwater pollution prevention, illicit discharge detection and elimination, restoration plan development, and other permit requirements are evidence of the continued commitment and strengthening of the collective stormwater programs of the co-permittees. The co-permittees further demonstrate the commitment to achieve the impervious restoration requirement and other provisions and requirements contained in the permit through the Memorandum of Agreement (MOA) signed by all co-permittees. This MOA obligates funding for the capital costs to meet the permit's impervious restoration requirements associated with the municipalities, as well as overall administrative support by the County.

The U.S. Environmental Protection Agency (EPA), MDE, and the courts have determined that the 20 percent restoration requirement is an approved effluent limit consistent with, and satisfactory for, addressing both the Chesapeake Bay and other applicable Total Maximum Daily Load (TMDL) wasteload allocations (WLAs). The County and the municipal co-permittees continue to actively and aggressively implement an adaptive program of restoration to achieve the fourth generation permit's impervious treatment requirements. As shown in G. Program Funding section of this report, the resources needed to support the operating expenses of this program and permit administration, as well as the funding necessary to address the impervious restoration requirement, are programmed and budgeted for the permit term. Additionally,D. Management Programs and G. Program Funding sections demonstrate that the programmatic structure is in place to develop restoration plans to address WLAs and approved TMDLs for all of the County's watersheds which have a TMDL requirement.

Recognition should be given to a conflict between the requirement for specific projects, costs, and deadlines required in restoration plans to meet WLAs and the allowance for an iterative process of continuous, adaptive implementation within the regulatory framework of this permit. Application of the scientific method to the TMDL implementation process should allow for the error and uncertainty in the modeling process by establishing a margin of error, or subsequently a margin of safety, that does not assume the modeling results and WLA are underestimating the effort needed to achieve water quality standards. Rather, a more appropriate adaptive implementation approach for TMDL compliance might be to apply the same approach used with impervious surface area restoration, which sets a percentage to be achieved in each permit term. The current approach expectation is a very specific and substantial commitment of funds and projects that may or may not be needed to achieve WLA and TMDLs.

Part IV. Standard Permit Conditions

A. Permit Administration

The legal responsibility for maintaining the conditions included in this permit lies with the Carroll County Board of Commissioners. In addition the previously referenced municipal MOA also outlines specific programmatic and legal responsibilities between the County and co-permittees. The Commissioners have delegated responsibility to the Carroll County Department of Land and Resource Management (LRM) to provide administrative and technical implementation of the NPDES MS4 permit. The LRM Director provides direct administration of the permit. An organizational chart for program administration can be found in **Appendix A**.

LRM has two dedicated positions, NPDES Compliance Specialists, assigned to the NPDES MS4 program. The NPDES Compliance Specialist positions are jointly funded by Carroll County and the eight incorporated municipalities. This arrangement was coordinated through the Water Resource Coordination Council (WRCC). Under the direction of the Director, the NPDES Compliance Specialists implement certain aspects of NPDES MS4 program requirements. Key responsibilities for these positions include:

- Technical Liaison to MDE;
- Coordinates, manages, and implements certain permit requirements in accordance with federal, state, and local laws;
- Coordinates with County/municipal personnel, other government officials, and citizens regarding NPDES compliance issues;
- Conducts and coordinates illicit discharge inspection screenings and routine surveys with County/municipal personnel to discover and eliminate pollutant sources;
- Coordinates with County personnel in the design, implementation, and maintenance of the County's NPDES Geographic Information System (GIS) and MDE Geodatabase Submission applications for NPDES MS4 compliance; and
- Coordinates development of compliance education, training, and outreach programs.

The Bureau of Resource Management (BRM) provides vital NPDES MS4 operational and technical support, including fieldwork, GIS operations, monitoring, inspections, compliance, watershed management, and various other responsibilities. The BRM holds the primary responsibility for external environmental compliance through the administration of Carroll County Government's environmental and land development codes, ordinances, and standards. These include stormwater management, floodplain management, forest conservation, landscape enhancement, water resource management, grading, erosion and sediment control, and environmental management of storm sewer systems.

The County/municipal joint permit eliminates political boundaries as a watershed planning consideration. Specific responsibilities related to permit reporting and support by the municipalities are outlined in the MOA. This working relationship has made compliance with the NPDES MS4 requirements more purposeful and effective. The NPDES Compliance

Specialists support each municipality in storm sewer system mapping, illicit discharge detection and elimination inspections and investigations, visual surveys, training, 12SW permit applicability, property management and maintenance practices, public education and outreach efforts, etc.

Annual written agreements between the County and each municipality further delineate services the County will provide to support implementation and compliance with the permit and the environmental and land development codes, ordinances, and standards to support the County's program. **Table 1** shows the assignment of responsibilities for review, inspection, and bonding for each municipality.

Compliance by each individual co-permittee jurisdiction with various other specific permits lies with County agencies or municipalities that oversee the facilities. Coordination between these agencies and LRM regarding NPDES compliance remains a priority. In addition, the County continues to work jointly with the municipalities to ensure ongoing implementation of compliance responsibilities. Any future changes in the administration of this permit will be reported to MDE.

Table 1
Review, Inspection, and Bonding: Assignment of Responsibilities

Carroll County Code & Activity	Hampstead	Manchester	Mount Airy	New Windsor	Sykesville	Taneytown	Union Bridge**	Westminster
Floodplain								
Review*	C/C	C/C	C/C	C/C	C/C	C/C	C/M	M/M
Bond	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Inspection	C	C	C	C	C	C	C	M
Easement	C	C	C	C	C	C	M	M
Grading								
Review*	C/C	C/C	C/C	C/C	C/C	C/C	C/C	C/C
Bond	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Inspection	C	C	C	C	C	C	C	C
Sediment Control								
Review*	SCD/S	SCD/S	SCD/S	SCD/S	SCD/S	SCD/S	SCD/S	SCD/S
Bond	C	C	M	C	M	M	C	C
Inspection	C	C	C	C	M/C	C	C	C
Stormwater Management								
Review*	C/C	C/C	C/C	C/C	C/C	M	C/M	C/M
Bond	C	C	M	C	M	M	M	M
Inspection	C	C	C	C	C	M	C	C
Easement	C	M	M	M	M	M	M	M
Landscape								
Review*	C/C	C/C	C/M	C	C/M	C/C	M/M	M/M
Bond	C	C	M	C	M	C	M	M
Inspection	C	C	M	C	M	C	M	M
Forest Conservation								
Review*	C/C	C/C	C/C	C/C	C/C	C/C	C/C	C/C
Bond	C	C	C	C	C	C	C	C
Inspection	C	C	C	C	C	C	C	C
Easement	C	C	C	C	C	C	C	C
Water Resources								
Review*	C/No Code	C/C	C/C	C/C	C/C	C/ No Code	M	CO/ No Code
Bond	N/A	N/A	N/A	N/A	N/A	N/A	M	N/A
Inspection	N/A	C	N/A	C	C	N/A	M	N/A
Easement	N/A	C	M	C	C	N/A	M	N/A

Key: **C = County** **M = Municipality** **S = State** **SCD = Carroll Soil Conservation District**

Source: Carroll County Bureau of Resource Management

** Review performed by / whose code*

***County assumed responsibilities associated with stormwater management in December 2015.*

B. Legal Authority

Continuation of Established Authority – The legal authority established under this permit remains within the Carroll County Code of Public Local Laws and Ordinances ("County Code"). In addition, the MOA between the County and incorporated municipalities dated October 2014 establishes cost-sharing and co-permittee responsibilities in complying with this permit.

Chapter 53 of the County Code, Environmental Management of Storm Sewer Systems, was adopted by all permit jurisdictions. The chapter gives Carroll County and the municipalities a practical, effective regulatory tool that provides standards to protect the MS4 described in detail under Part 5.3 Management Programs Section of this report.

C. Source Identification

The Maryland Department of Environment published a geodatabase design (GDB) in 2015 to support reporting for municipal NPDES permits. The intent of the GDB is to provide a framework for the data required in "Attachment A" of the NPDES permits. MDE requested that if possible jurisdictions submit their Attachment A data in the new GDB format.

Over the past year, Carroll County has continued migrating data from various internal data sources into the new GDB format. Carroll County will continue to work with MDE to refine the database design and perform quality assurance reviews of our data.

The County did have to make some revisions to the GDB provided by MDE to allow for the County data to be entered. However, the only changes made to the GDB were those specifically addressed and allowed by MDE per the comments pertaining to the 2017 Annual Report and GDB submittal. It is anticipated that discussions with MDE regarding the relevancy of certain fields along with further quality assurance updates on the County data will lead to the County data loading clearly in the future. **Appendix G** provides documentation related to issues/concerns associated with the current GDB. This documentation includes the above mentioned permitted changes as the County still believes these changes should be formally made to the GDB format supplied by MDE.

It is the mutual intent of the County and MDE to utilize the new GDB to facilitate the reporting and review of the Carroll County NPDES permit data. This transition period should be considered as a test phase and thus data conversion issues should be expected. We welcome the comments and dialogue that will develop from MDE's review of the data. We ask however that MDE keep in mind that there is a significant level of effort being expended by the County to migrate to this new format and the process is not yet complete. With the finalization of the MDE GDB schema and the ongoing cleanup of the County data, we expect that with our next permit term, the GDB will be functioning as required.

The permit requires identification of the sources of pollutants in stormwater and the systems which convey the runoff. Carroll County maintains staffing dedicated to NPDES MS4 compliance, concentrating on those efforts that relate to storm drain system delineation and facility compliance. GIS with incorporated GPS technology are employed to assist in mapping and data analysis to help identify drainage systems exhibiting stormwater quality deficiencies. GIS and GPS also provide detailed locations for issues identified during the watershed assessments, which aids in developing effective restoration plans.

1. Storm Drain System

Carroll County maintains an inventory of storm drain infrastructure to facilitate the identification of source pollutants in stormwater runoff within the County and co-permittee municipalities. System mapping maintenance efforts include the utilization of as-built surveys of newly submitted storm sewer systems in digital format as required through the development process. Other sources for data capture include; archive records, desktop review, outfall screening

verification, and public works staff observations. Management of this information is implemented through the County's GDB that stores data representing the infrastructure using ArcMap 10.3 software. The GDB has been restructured and developed by the BRM in conjunction with MDE's NPDES, MS4, Geodatabase Design, published in March, 2015 and revised May 2017. The goal of the County's database design is to meet internal recording requirements of the County, while facilitating the reporting parameters of the MDE database. A functional classification of structures includes a designation of NPDES Study Point that includes major outfalls and other targeted outfalls monitored and screened for Illicit Discharge Detection and Elimination (IDDE) purposes.

The storm drain infrastructure database was expanded to add an owner classification field to clarify County and Municipal MS4 owner/operator status to clarify MS4 and non-MS4 interface connections in tracking potential source pollutants and system property management and maintenance responsibilities. County and Municipal co-permittee personnel are involved in the process with local system knowledge, map and field verification. Digital storm drain system map files and hard copy maps are available as a quick reference tool to each Municipality and County agencies as needed. The **Appendix B** CD MS4 Geodatabase contains outfall and associated drainage area data.

2. Industrial and Commercial Sources

Carroll County maintains an inventory of industrial and commercial land uses and sites it has determined to have the potential to contribute significant pollutants as described in the previous annual report. This inventory is maintained in a geodatabase with periodic additions and subtractions based on the previous year's visual survey observations. The methodology for selecting these areas was documented in the 2015 Annual Report. MDE requested by recent IDDE audit letter (see Appendix C) that Carroll County evaluate expanding the criteria to determine if additional areas would increase the inventory. A preliminary exercise indicates the inventory would increase. The County intends to evaluate its entire IDDE Visual Survey program at the end of the 5 year permit term. This assessment will review adjustment to selection criteria for the inventory as well as survey procedures for efficiency and effectiveness. Carroll County will report on the result in the 2019 Annual Report.

3. Urban Best Management Practices (Stormwater Management Facility Data)

The BRM manages stormwater management facility data for the County and municipalities in the new geodatabase. The geodatabase contains information related to facility location, ownership, reviews and approvals, drainage area, impervious area, inspections, and other potential information for the 2,478 active Best Management Practices (BMPs).

Currently there are 979 as-built certified and approved structural stormwater management BMP's throughout the County and municipalities, excluding the City of Taneytown. Of these BMP's, there are 50 structural restoration practices. This number does not include Taneytown's 46 structural BMP's. All facilities, drainage areas, and outfalls have been mapped with associated data provided. There are 1,447 non-structural practices (ESD practices), excluding the 6 practices in Taneytown. Of these BMPs, there are 5 non-structural restoration practices.

The City of Taneytown continues to review development files for as-builts having located and indexed plans for 18 facilities thus far. They are currently working with their engineer to acquire the remaining as-builts and obtain the necessary documentation relating to these facilities.

Appendix B includes the County stormwater management database map of newly added stormwater facilities in the County.

4. Impervious Surfaces

Carroll County's Fourth Generation Permit Impervious Surface Analysis (**Figure 1)** provides a breakdown of the history and future of the impervious area treatment. During the last permit term, 10 percent of untreated impervious area was required to be treated. The baseline was based on the 6,720 acres of untreated impervious area in the County; this number did not include the municipalities (Phase II jurisdictions). Six hundred eighty-eight (688) acres of impervious area were treated during that permit term which exceeded the 672 required acres, yielding a remaining 6,032 acres of untreated impervious area.

As agreed upon with MDE, the County was permitted to work toward addressing the next 20 percent treatment requirement which was anticipated to be part of the next generation permit issued on December 29, 2014 (current permit). In December of 2014, the County entered into a MOA with the 8 municipalities joining together as a Phase I jurisdiction on the existing permit. The untreated impervious acreage associated with the municipalities (2,265 acres) was then added to the remaining County untreated impervious areas (5,805 acres determined during a re-evaluation of the County's impervious acreage) for a new baseline of 8,070 acres.

Activities associated with treatment efforts which have been taken during this permit term are listed in **Table 11** "Listing of Watershed Restoration Efforts July 2018 NPDES". Impervious acres treated to date are 1,634.8. There are projects under construction or in design, scheduled for completion in 2019 and 2020 which will treat an additional 798.41 acres bringing the anticipated County total for this permit to 2,433.21 acres. During the next two (2) years, the County anticipates approximately 33 acres of Forested and Grassed Buffer credits through the development process. The County total would then be 2,466 which is 152.8% of the 20% permit requirement of 1,614 acres.

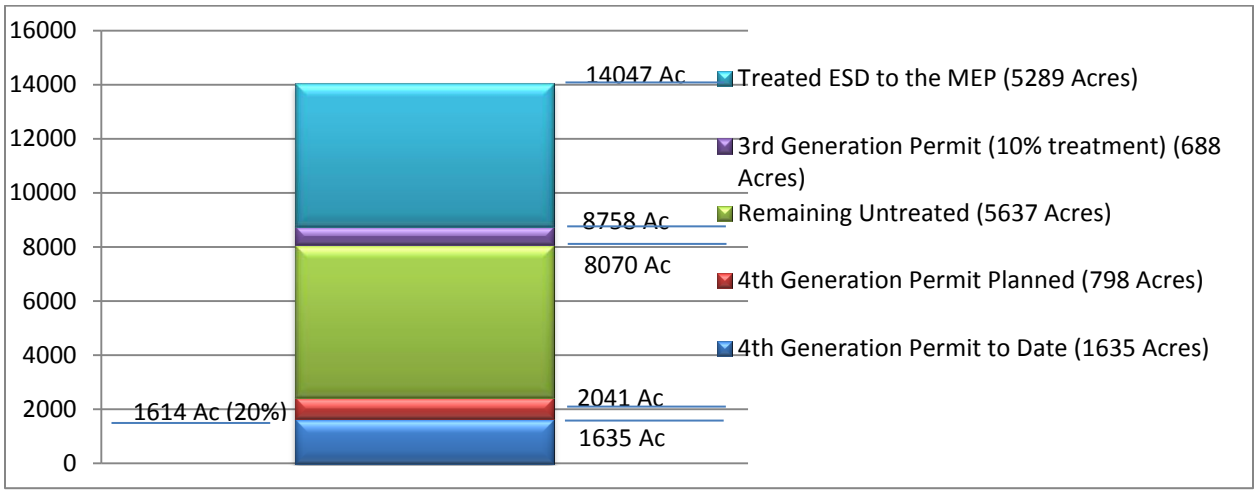


Figure 1: Carroll County Fourth Generation Permit Impervious Surface Analysis

5. Monitoring Locations and Watershed Restoration

The BRM is responsible for monitoring and watershed assessment efforts required under the NPDES MS4 permit. These efforts include the survey and verification of existing conditions as well as the performance of site and natural resource assessments and potential water quality issues. These efforts are integral to the NPDES MS4 program since the results provide a means for measuring program implementation. The BRM's watershed assessments support the development of restoration plans required in the permit. Staff identifies watershed restoration opportunities and implements watershed improvement projects. Efforts related to these items are provided in Part IV.E. of this report.

6. Water Quality Improvement Projects

Carroll County continues to vigorously apply its watershed restoration efforts, i.e., impervious surface mitigation and water quality improvements. Projects are designed, managed, and implemented by BRM through a capital improvement program, titled "Watershed Assessment and Improvement (NPDES)" in the Carroll County Community Investment Plan (CIP). Funding for operating (administrative/technical) and capital (engineering and construction functions) is discussed in detail in Part IV.G. of this report.

The County continues to plan, design, and implement restoration projects including the following:

- rehabilitating and upgrading older stormwater management facilities to current standards;
- implementing BMPs to manage existing untreated impervious areas; and
- planting stream buffers.

From July 1, 2017, through June 30, 2018, construction occurred on 9 stormwater management retrofit projects, treating 194.582 acres of untreated impervious area and 411 acres of drainage area. **Table 2** provides an overview of restoration projects from 1993-2018 according to watershed. Included in the Annual Report in **Appendix F** are tables summarizing how work associated with meeting local WLAs translates into actual Chesapeake Bay TMDL reductions.

The BRM maintains a GIS data layer for both forest and grass buffers which are portions of land acquired through the development review process in the form of a **perpetual** easement. The acquisition of stream buffer easements is directly adjacent to new development. As part of recordation, these easements are dedicated to the Board of County Commissioners and/or relevant municipalities in certain cases. These easements are inspected for compliance with the deed of easement on a triennial basis. As of June 30, 2018, the County holds easements on approximately 1,034 acres of forest buffer and 1,128 acres of grassed buffer.

Table 2 Water Quality Improvements - Watershed Restoration Projects 3rd Generation Permit						
Project Name	MDE Watershed Name	Drainage Area (Acres)	Impervious Area Credit (Acres)	Total Nitrogen (lbs/year)	Total Phosphorus (lbs/year)	TSS (Tons/year)
1993-2005 Forest Buffer Easements	Double Pipe Creek		6.77	96.56	3.42	0.77
1993-2005 Grass Buffer Easements	Double Pipe Creek		18.45	221.71	11.77	2.63
			25.22	**318.27**	**15.19**	**3.40**
1993-2005 Forest Buffer Easements	Liberty Reservoir		81.34	1163.05	41.16	9.21
1993-2005 Grass Buffer Easements	Liberty Reservoir		80.5	961.4	51.04	11.42
Carroll County Times	Liberty Reservoir	6.6	0.5	15	12.16	4.49
Longwell County Park	Liberty Reservoir	211.2	142.8	45	36.48	13.47
			305.14	**2184.45**	**140.84**	**38.60**
Piney Run	Loch Raven Reservoir	397.04	258.07	70.2	56.91	21.01
			258.07	**70.20**	**56.91**	**21.01**
1993-2005 Forest Buffer Easements	Lower Monocacy		0.72	10.42	0.37	0.08
1993-2005 Grass Buffer Easements	Lower Monocacy		4.85	58.22	3.09	0.69
			5.57	**68.64**	**3.46**	**0.77**
1993-2005 Forest Buffer Easements	Prettyboy Reservoir		7.08	101.17	3.58	0.80
1993-2005 Grass Buffer Easements	Prettyboy Reservoir		6.79	81.71	4.34	0.97
			13.87	**182.88**	**7.92**	**1.77**
1993-2005 Forest Buffer Easements	S Branch Patapsco River		48.72	695.95	24.63	5.51
1993-2005 Grass Buffer Easements	S Branch Patapsco River		22.73	272.5	14.47	3.24
			71.45	**968.45**	**39.10**	**8.75**
1993-2005 Forest Buffer Easements	Upper Monocacy		2.84	40.36	1.43	0.32
1993-2005 Grass Buffer Easements	Upper Monocacy		6.11	73.26	3.89	0.87
			8.95	**113.62**	**5.32**	**1.19**
		Total this Permit Term	**688.27**	**3906.51**	**268.74**	**75.50**

Water Quality Improvements - Watershed Restoration Projects						
4th Generation Permit						
Project Name	MDE Watershed Name	Drainage Area (Acres)	Impervious Area Credit (Acres)	Total Nitrogen (lbs/year)	Total Phosphorus (lbs/year)	TSS (tons/year)
2009-2018 Ag to Septic Developed	Conewago			16.2		
Septic Denitrification	Conewago		0.78			
			0.78	**16.2**	**0.00**	**0.00**
2006-2018 Forest Buffer Easements	Double Pipe Creek		31.38	448.60	15.88	3.55
2006-2018 Grass Buffer Easements	Double Pipe Creek		51.23	614.83	32.64	7.31
2009-2018 Ag to Septic Developed	Double Pipe Creek			290.20		
2009-2018 Ag to Sewer Developed	Double Pipe Creek			1023.60		
2018 Inlet Cleaning	Double Pipe Creek		0.55	4.83	1.93	0.29
2018 Street Sweeping	Double Pipe Creek		4.11	35.27	3.92	2.63
Blue Ridge Manor	Double Pipe Creek	36.28	11.25	288.69	21.23	4.98
Carroll County Farm Museum	Double Pipe Creek	6.44	0.50	46.03	2.51	0.50
Carroll County Maintenance Center	Double Pipe Creek	45.49	34.44	237.47	31.70	9.81
Exceptional Center	Double Pipe Creek	46.5	16.57	216.22	23.03	6.62
Farm Museum 1	Double Pipe Creek	11.61	2.55	87.70	5.96	1.35
Farm Museum 2	Double Pipe Creek	0.09	0.05	0.72	0.07	0.02
Farm Museum 3	Double Pipe Creek	0.79	0.06	5.26	0.29	0.06
Farm Museum 4	Double Pipe Creek	0.03	0.03	0.27	0.04	0.01
Farm Museum 5	Double Pipe Creek	0.01	0.01	0.09	0.01	0.00
Friendship Overlook/Diamond Hills	Double Pipe Creek	82.01	18.58	369.06	33.50	8.96
Septic Denitrification	Double Pipe Creek		12.22	0.00	0.00	0.00

Project Name	MDE Watershed Name	Drainage Area (Acres)	Impervious Area Credit (Acres)	Total Nitrogen (lbs/year)	Total Phosphorus (lbs/year)	TSS (tons/year)
Sunnyside Farms	Double Pipe Creek	30.2	3.30	131.83	10.04	2.42
Tree Plantings	Double Pipe Creek		20.72	388.40	18.04	2.17
			207.55	**4189.09**	**200.78**	**50.69**
2006-2018 Forest Buffer Easements	Liberty Reservoir		118.49	1693.66	59.94	13.42
2006-2018 Grass Buffer Easements	Liberty Reservoir		72.43	869.18	46.14	10.33
2009-2018 Ag to Septic Developed	Liberty Reservoir			1365.20		
2009-2018 Ag to Sewer Developed	Liberty Reservoir			746.40		
2018 Inlet Cleaning	Liberty Reservoir		6.89	60.28	24.11	3.62
2018 Street Sweeping	Liberty Reservoir		1.88	16.50	1.83	1.19
Bateman SWM Pond	Liberty Reservoir	47.25	6.20	359.24	20.50	4.23
Central Maryland (Wet Facility)	Liberty Reservoir	92.72	35.51	972.23	100.23	28.13
Collins Estate	Liberty Reservoir	16.34	3.90	74.26	6.75	1.81
Diamond Hills Section 5	Liberty Reservoir	51.8	16.27	241.39	23.72	6.58
Edgewood	Liberty Reservoir	38	16.70	314.76	24.91	6.07
Eldersburg Business	Liberty Reservoir	97.98	70.36	507.50	66.98	20.69
Eldersburg Elementary School	Liberty Reservoir	1.3647	1.40	6.72	1.01	0.33
Elderwood Village	Liberty Reservoir	7.64	3.40	36.81	3.97	1.14
Feeser Property	Liberty Reservoir	4.38	1.72	32.89	2.83	0.71
Finksburg Industrial Park	Liberty Reservoir	67.8	22.34	293.78	31.65	9.13
Heritage Heights	Liberty Reservoir	21.38	4.10	87.15	7.89	2.11
Hickory Ridge	Liberty Reservoir	23.75	6.60	188.27	12.82	2.92
High Point	Liberty Reservoir	4.7	0.90	32.78	2.21	0.50
Marriott Wood I Facility #1	Liberty Reservoir	2.5	0.60	10.32	0.98	0.27
Marriott Wood I Facility #2	Liberty Reservoir	7.12	2.80	33.84	3.49	0.99
Marriott Wood II	Liberty Reservoir	7.51	1.90	34.33	3.08	0.82
Miller/Watts	Liberty Reservoir	39.65	35.24	213.70	30.59	9.66

Project Name	MDE Watershed Name	Drainage Area (Acres)	Impervious Area Credit (Acres)	Total Nitrogen (lbs/year)	Total Phosphorus (lbs/year)	TSS (tons/year)
Oklahoma II Foothills	Liberty Reservoir	23.72	8.10	111.06	11.01	3.06
Oklahoma Phase I	Liberty Reservoir	24.44	10.00	116.63	12.19	3.47
Quail Meadows	Liberty Reservoir	111.97	23.25	459.21	42.53	11.49
Randomhouse	Liberty Reservoir	41.8	22.52	206.46	23.94	7.08
Septic Denitrification	Liberty Reservoir		20.28			
Tree Plantings	Liberty Reservoir		10.12	189.62	8.81	1.06
Upper Patapsco Phase I -Naganna	Liberty Reservoir	24.6	13.90	122.32	14.45	4.30
Upper Patapsco Phase II - Hoff	Liberty Reservoir	101.8	4.10	437.52	29.47	6.49
Westminster Airport Pond	Liberty Reservoir	204.84	93.50	975.73	115.34	34.44
Westminster Community Pond	Liberty Reservoir	250.22	87.85	1175.47	116.61	32.43
Westminster High School	Liberty Reservoir	117.25	44.81	555.50	56.72	15.97
Wilda Drive	Liberty Reservoir	6.75	1.63	28.50	2.75	0.76
			769.69	**12569.22**	**909.45**	**245.18**
2006-2018 Forest Buffer Easements	Loch Raven Reservoir		0.07	1.04	0.04	0.01
2006-2018 Grass Buffer Easements	Loch Raven Reservoir		1.68	20.17	1.07	0.24
2018 Inlet Cleaning	Loch Raven Reservoir		1.84	16.08	6.43	0.96
			3.59	**37.29**	**7.54**	**1.21**
2006-2018 Forest Buffer Easements	Lower Monocacy		3.39	48.45	1.71	0.38
2006-2018 Grass Buffer Easements	Lower Monocacy		0.18	2.21	0.12	0.03
2009-2018 Ag to Septic Developed	Lower Monocacy			60.40		
2009-2018 Ag to Sewer Developed	Lower Monocacy			295.20		
2018 Inlet Cleaning	Lower Monocacy		0.15	1.29	0.52	0.08

Project Name	MDE Watershed Name	Drainage Area (Acres)	Impervious Area Credit (Acres)	Total Nitrogen (lbs/year)	Total Phosphorus (lbs/year)	TSS (tons/year)
Septic Denitrification	Lower Monocacy		1.04			
Tree Plantings	Lower Monocacy		4.65	87.03	4.04	0.49
			9.41	**494.58**	**6.39**	**0.98**
2006-2018 Forest Buffer Easements	Patapsco River L N Br		1.15	16.39	0.58	0.13
2006-2018 Grass Buffer Easements	Patapsco River L N Br		0.00	0.03	0.00	0.00
			1.15	**16.42**	**0.58**	**0.13**
2006-2018 Forest Buffer Easements	Prettyboy Reservoir		8.98	128.33	4.54	1.02
2006-2018 Grass Buffer Easements	Prettyboy Reservoir		14.80	177.66	9.43	2.11
2009-2018 Ag to Septic Developed	Prettyboy Reservoir			122.80		
2009-2018 Ag to Sewer Developed	Prettyboy Reservoir			199.20		
2018 Inlet Cleaning	Prettyboy Reservoir		3.28	28.74	11.49	1.72
Hampstead Impervious Removal	Prettyboy Reservoir		0.13	0.34	0.22	0.06
Septic Denitrification	Prettyboy Reservoir		3.12			
Small Crossings Bioretention	Prettyboy Reservoir	1.15	0.53	8.79	0.79	0.20
Small Crossings Sand Filter	Prettyboy Reservoir	26.73	11.02	219.44	17.84	4.37
Tree Plantings	Prettyboy Reservoir		4.25	79.64	3.70	0.45
			46.11	**964.94**	**48.02**	**9.92**
2006-2018 Forest Buffer Easements	S Branch Patapsco River		37.71	539.05	19.08	4.27
2006-2018 Grass Buffer Easements	S Branch Patapsco River		21.25	255.03	13.54	3.03
2009-2018 Ag to Septic Developed	S Branch Patapsco River			532.20		
2009-2018 Ag to Sewer Developed	S Branch Patapsco River			288.00		

Project Name	MDE Watershed Name	Drainage Area (Acres)	Impervious Area Credit (Acres)	Total Nitrogen (lbs/year)	Total Phosphorus (lbs/year)	TSS (tons/year)
2018 Inlet Cleaning	S Branch Patapsco River		0.82	7.20	2.88	0.43
Arthur Ridge	S Branch Patapsco River	51.17	6.60	225.28	17.54	4.30
Benjamin's Claim	S Branch Patapsco River	47.1	20.55	226.93	24.73	7.16
Benjamin's Claim Basin B	S Branch Patapsco River	1.33	0.56	5.95	0.70	0.21
Braddock Manor West	S Branch Patapsco River	49.3	10.52	222.86	19.12	4.95
Brimfield	S Branch Patapsco River	34.69	12.60	281.51	20.84	4.94
Carrolltowne 2A Gemini Drive	S Branch Patapsco River	87.73	47.26	433.25	50.26	14.87
Carrolltowne 2B	S Branch Patapsco River	34.61	14.27	165.32	17.34	4.94
Chung	S Branch Patapsco River	102.93	10.00	0.00	0.00	0.00
Clipper Hills - Gardenia	S Branch Patapsco River	33.19	15.24	160.53	17.50	5.06
Clipper Hills - Hilltop	S Branch Patapsco River	80.17	25.49	373.20	35.86	9.83
Eldersburg Estates 3-5	S Branch Patapsco River	34.91	11.22	162.67	15.68	4.31
Harvest Farms 1A	S Branch Patapsco River	43.8	11.25	183.02	18.13	5.05
Hawks Ridge	S Branch Patapsco River	63.48	25.10	302.93	32.14	9.21
Jenna Estates	S Branch Patapsco River	15.35	0.50	0.00	0.00	0.00
Parrish Park	S Branch Patapsco River	94.23	18.20	384.30	34.85	9.32
Septic Denitrification	S Branch Patapsco		8.06			

Project Name	MDE Watershed Name	Drainage Area (Acres)	Impervious Area Credit (Acres)	Total Nitrogen (lbs/year)	Total Phosphorus (lbs/year)	TSS (tons/year)
	River					
South Carroll High School	S Branch Patapsco River	24.22	12.90	191.08	18.68	4.86
Tree Plantings	S Branch Patapsco River		5.74	107.49	4.99	0.60
Winfield Fire Department	S Branch Patapsco River	0.22	0.20	2.08	0.27	0.07
			316.04	**5049.90**	**364.12**	**97.40**
2006-2018 Forest Buffer Easements	Upper Monocacy		2.79	39.90	1.41	0.32
2006-2018 Grass Buffer Easements	Upper Monocacy		3.74	44.92	2.38	0.53
2009-2018 Ag to Septic Developed	Upper Monocacy			67.40		
2009-2018 Ag to Sewer Developed	Upper Monocacy			38.40		
2018 Inlet Cleaning	Upper Monocacy		0.03	0.29	0.11	0.02
Septic Denitrification	Upper Monocacy		3.12			
Tree Plantings	Upper Monocacy		10.67	200.22	9.30	1.12
			20.35	**391.13**	**13.20**	**1.99**
2018 Septic Pumping			260.13	0.00	0.00	0.00
		Total this Permit Term	**1634.80**	**23728.77**	**1550.08**	**407.50**

D. Management Programs

The Environmental Inspections Services Division (EISD) of the BRM is responsible for all inspections and enforcement actions necessary to ensure that the conditions established in the review, approval, and permitting phases are met. The EISD also contributes to compliance with the County NPDES responsibilities by providing stormwater management facility maintenance inspections and assistance with illicit discharge inspections and visual surveys. During the permit year, EISD performed a total of 10,989 environmental inspections which included inspections other than those required in the NPDES permit.

1. Stormwater Management

The County stormwater management program is the responsibility of the BRM within LRM and implements Chapter 151 of the Carroll County Code of Public Local Laws and Ordinances. The implementation of Chapter 151 is applied to the municipalities of Hampstead, Manchester, Mount Airy, New Windsor, Sykesville, and Union Bridge. The City of Westminster has its own approved stormwater management code, which is implemented by the County. The City of Taneytown implements an approved stormwater management code independent of the County (see **Table 1**). Reviews performed by the County are the responsibility of the Program Engineer and the Stormwater Management Review Assistant. Review and approval of stormwater management during the period of July 1, 2017, through June 30, 2018, consisted of 584 plans reviewed, 27 structural as-builts, and 205 non-structural as-builts were approved.

Residential stormwater management facilities and storm sewer systems in unincorporated areas are owned by the County while the municipalities own the residential facilities in their respective jurisdictions. All commercial and industrial facilities in the County and municipalities are maintained by the property owners. Database information on facilities located in Carroll County and an updated map are contained in **Appendix B** of this report.

Inspections of facilities in the County and 7 of the 8 municipalities are handled by EISD. Maintenance inspections are performed each calendar year. Each facility is inspected every 3 years, with letters sent to the owner indicating the condition of the facility and the amount of time allowed for compliance to be achieved. In the case of County-owned structures, the notice is sent to the Bureau of Facilities, Bureau of Roads Operations, and BRM. The EISD performed 379 inspections this year; 321 individual facilities were inspected. Follow-up inspections are performed to ensure compliance has been achieved in a timely matter. Of those 321 facilities, 59 facilities needed corrective action and 50 were brought into compliance as of June 30, 2018. In cases where violations still exist, 22 facilities were issued Notices of Violation allowing an additional amount of time to resolve issues. The following is a breakdown of the 1,025 structural stormwater management facilities in Carroll County currently being inspected: 365 will be inspected during calendar year 2019, 310 will be inspected in 2020 and 350 will be inspected in 2021.

Currently, there are 1,409 non-structural practices throughout the County and 390 inspections were performed in FY 2018 on 375 practices. Fifteen of the structures failed inspections;

however, 13 were brought into compliance by the end of the permit year. The EISD inspectors will be scheduling inspections over the next 3 years to balance out the inspections performed over the 3 year period. They anticipate at least 464 will be inspected in FY2019, 362 in FY 2020, and 583 in FY2021.

According to COMAR 26.17.02, preventative maintenance inspections of all ESD treatment systems and structural stormwater management facilities must be conducted at least on a triennial basis. This function is performed by the County for all municipalities except the City of Taneytown. Taneytown performs its own inspections.

City of Taneytown

Stormwater management structures and infrastructure intended for ownership by the City are inspected as constructed, typically by City staff and the City's consultant engineer. Frequency of inspections, and reports of such inspections, are determined by project specific factors. Reports, including narratives and photographs, are submitted to the Department of Public Works (DPW) for maintenance per the Department's State-approved records retention schedule. Facilities intended to be deeded to the City are typically the product of residential development projects, which may include storm sewer system improvements, ESD features, stormwater management structures, and transfer of real property or deeds of easement. Projects involving stormwater management on City-owned properties, or involving City-owned facilities, are also subject to construction inspections by the City or its contractor. Park development projects and construction of or improvements to existing water, sewer, or stormwater infrastructure, are typical of these projects. These projects follow the same construction inspection, reporting, and report retention process as other projects intended for City ownership.

Stormwater management facilities, whether ESD, structural BMPs, or other features that are intended to remain under private ownership, are inspected during construction by the developer's engineer in accordance with approved construction drawings, utilizing an inspection schedule incorporated into the stormwater management plan. The City's consultant engineer reviews and approves stormwater management plans prior to construction, and upon completion of projects, completes a review of stormwater "as-built" drawings, which are certified by the developer's engineer, prior to release of construction surety. The City's DPW also provides inspection of completed stormwater facilities and coordinates with the City consultant engineer on approvals. As-built plans are maintained by the City's Planning and Zoning Department in accordance with the Department's State-approved retention schedule. The City is currently working to compile a list of as-built stormwater management plans and dates said plans were certified.

The City of Taneytown is required to inspect all public and private stormwater management facilities every 3 years under the City of Taneytown's stormwater management ordinance. Per the City's "Stormwater Management Facilities Inspection Report" prepared by the City's consulting engineer, all stormwater management facilities within the City of Taneytown are inspected on a triennial basis. The consulting engineer inspected 41 stormwater management facilities for the City between May 24, 2018, and June 8, 2018.

2. Erosion and Sediment Control

The EISD of the BRM is responsible for inspection and enforcement of erosion and sediment control in accordance with Chapter 152 of the County Code. On March 14, 2017, BRM received results of the delegation review conducted in October of 2016. Concerns were raised relating to the number of field modifications being made by the inspection staff. In May of 2018, MDE approved the proposed revisions to the "Major and Minor Modifications for the Maryland Department of Environment and Soil Conservation District Approved Erosion and Sediment Control Plan".

Inspection statistics relating to grading permits and inspections during the reporting timeframe are as follows: 91 grading permits were issued and 3,583 sediment control inspections were performed. All inspections are recorded with notices sent regardless of the site conditions. In 10 cases, Stop Work Orders were posted for violations, which in most instances required compliance within 36 hours. Currently, there are 5 outstanding violations moving through the enforcement process.

Grading permits are issued on all projects with disturbance in excess of 5,000 square feet. Pre-construction meetings are held to discuss the project and meet with the site foreman; who holds a valid “Responsible Personnel Certification” as required by MDE. As part of the NPDES permit requirements, grading permits issued with earth disturbance in excess of 1 acre are reported to MDE quarterly.

3. Illicit Discharge Detection and Elimination (IDDE)

The permit requires that an inspection and enforcement program continue to be implemented to ensure that all discharges to and from the MS4 that are not composed entirely of stormwater are either permitted by MDE, exempt under the NPDES Phase 1 MS4 permit, or eliminated. LRM performs illicit discharge monitoring, detection, and elimination and provides support in cooperation with municipal co-permittee responsibilities. The MOA between the County and the municipalities, wherein services are provided in support of the permit, satisfies part of this requirement. No modifications to municipal ordinances and regulations related to the County Code Chapter 53, “Environmental Management of Storm Sewer Systems,” were made in this permit year.

Field screening of at least 100 outfalls annually is performed by the EISD of the BRM and NPDES Compliance Specialists. Staff participated in annual IDDE training prior to the inspection season. Current standard operating procedures (SOPs) are in the County’s November 10, 2016 IDDE Guidance Manual. Screening assignments are prepared by County election district groupings and performed by EISD staff most familiar with stormwater management BMP facilities and local land use activities in these areas. Outfalls located in the 8 incorporated municipalities are inspected by an NPDES Compliance Specialist in cooperation with municipal staff most knowledgeable of their local environs.

To facilitate IDDE screening, an NPDES Study Point classification is assigned to major NPDES and other targeted outfalls that have greater illicit discharge potential, such as commercial and industrial land uses, densely populated areas, aging sewer infrastructure areas, or areas with past screening history. Outfalls with the study point designation and other outfalls are regularly evaluated and updated for relevance to facilitate a productive outfall screening program. Over 300 outfalls currently have the NPDES Study Point designation and will be inspected on a triennial basis. There were 101 outfalls screened for the permit year. Approximately 60 percent were located in the County and 40 percent were within the municipalities. Outfall screenings were distributed among 7 watersheds as follows: Prettyboy Reservoir (6), Loch Raven Reservoir (2), Liberty Reservoir (46), Patapsco River - South Branch (21), Lower Monocacy River (5), Double Pipe Creek (19), and the Upper Monocacy River (2) (see outfall screening map in **Appendix C**).

Dry weather screening found 33 outfall flows. Each outfall having a flow received a chemical field screening test for parameters defined by the permit. One outfall was identified as having an illicit discharge with a slightly elevated detergent level attributed to residential car washing, an exempt activity upon investigation. The municipality provides homeowner stormwater pollution information through various sources including vehicle washing alternatives. Deposit and maintenance comments were also recorded. The geodatabase includes the results of this year's outfall screening and can be found on CD in **Appendix B**.

Specific industrial and commercial land use areas with potential to contribute significant pollutants have been identified per PART IV.C.2. SOPs for conducting visual surveys of these commercial and industrial areas are in place for discovering, documenting, and eliminating pollutant sources in the MS4. Prior to conducting visual IDDE surveys, NPDES Compliance Specialists and EISD staff receive training and review permit regulations and procedures. If significant pollutant sources of concern or an illicit discharge are discovered, the property owner is contacted by the EISD or respective municipal authority. The SOP guidelines and County Code Chapter 53 relating to enforcement measures are followed until the source is eliminated. Good housekeeping/best management practice information may be provided in person or sent to businesses with potential significant sources as a result of the visual survey process. An assessment of the program will be conducted at the conclusion of the permit term to determine if changes are needed to improve the program or the methodology used for selection of sites. Approximately 45 remaining selected sites will be surveyed in 2019. The visual survey inspection form is functioning well guiding staff to identify significant pollutant sources that could be exposed to stormwater. The form focuses on key activities that are often hotspots for potential pollutants, the quality of related good housekeeping practices, and proximity to storm drain inlets or waterways. An example is provided in Appendix C.

A total of 58 visual surveys were conducted during the permit year. No illicit discharges were discovered. Eight (8) sites were listed to receive stormwater pollution prevention good housekeeping/BMP information. A Visual Survey (VS) Accela database is in place and managed by the County EISD. Updating the commercial/industrial site inventory database will be based on these observations and includes retaining 43 of the sites for future surveys while 15 sites will be removed. A number of these sites were determined to have active NPDES permits (w/pollution prevention plans) per the MDE Wastewater Interactive Search Portal, and the

remaining sites had a "no-exposure" condition with regard to "significant" pollutant sources, such as commercial offices, mini-storage facilities, and vacant business space.

The MS4 permittee is required to maintain a program to address and, if necessary, respond to illegal discharges, dumping, and spills. The County maintains a Stormwater Pollution Hotline for all Carroll County residents as indicated on the County website. "Illicit Discharge Incident Response" SOPs have been implemented and are documented in the County IDDE Guidance Manual to quickly respond to and eliminate potential illicit/pollutant discharges in the MS4. A Pollutant Discharge (PD) Accela database is in place and managed by the County EISD. Calls from the public are investigated and processed through this program and tracked through to abatement. Protocols are also in place for quick response to inter-agency and co-permittee reporting. EISD closely coordinates with respective municipalities for elimination if an incident proves to be an illicit discharge. Eighteen (18) illicit discharge complaints were processed during the permit reporting year. Thirteen (13) were confirmed illicit discharges: 6 commercial related, 5 residential, and 2 roadside stream dumpings. All were resolved through voluntary compliance or interagency efforts. An IDDE investigation summary is located in **Appendix C** of this report.

County Code Chapter 53 establishes methods of controlling the introduction of illicit discharges or pollutants into the MS4 in order to comply with requirements of the permit. The adoption of the ordinance by each municipality provides enforcement authority, either solely or in conjunction with the County, necessary to comply with permit requirements. **Table 3** lists the municipalities that have adopted this County Code and the responsible enforcement authority.

Table 3
Municipal Adoption and Enforcement Of Carroll County Code Chapter 53, Environmental Management Of Storm Sewer System

Municipality	Enforcement Authority
Hampstead	County
Manchester	County
Mount Airy	Municipal
New Windsor	County
Sykesville	Municipal
Taneytown	Municipal
Union Bridge	County
Westminster	Municipal

An annual NPDES Stormwater Pollution Prevention training event is held each fall for administrative and public works manager/supervisory-level personnel of pertinent County bureaus and the 8 municipalities. Attendance during this year's workshop was 63. An overview of the NPDES permitting program is provided along with MS4 and 12SW Industrial Permit requirements. The training strongly emphasizes good housekeeping BMPs, Stormwater Pollution Prevention Plan practices, IDDE, storm drain technology, public education and participation, employee training, and recordkeeping. Many County and municipal public works staffs are trained through their respective departments to perform visual inspections of storm drain systems as they go about their workday and report potential illicit discharges to their

supervisors. County and municipal staffs performing IDDE investigations and enforcement, responding to and reporting illicit discharges, dumping, spills, etc., per the permit, received training coordinated by the LRM NPDES MS4 staff. A total of 284 employees received training during the permit year covering the MS4 permit, general stormwater pollution prevention, good housekeeping/BMPs, and IDDE during the permit year.

On November 29, 2017, MDE conducted a field audit of the County's IDDE program. MDE issued a letter dated February 12, 2018 commending the County for its commitment to implementing a successful program finding the County in compliance with Part IV.D.3 of the permit. Informational requests noted in the letter have been addressed or responded to in this report in the appropriate sections. A copy of the MDE audit letter is located in Appendix C of this report.

4. Litter and Floatables

The permit requires the permittees to address problems associated with litter and floatables in waterways that adversely affect water quality. MDE is concerned with litter discharges to receiving waters and has required Carroll County to evaluate its current litter control associated with discharges from its storm drain system. The permit requires that a public outreach and education program be developed and implemented, as needed, on a watershed by watershed basis. The County, via its watershed assessment efforts, has not identified any issue related to litter and floatables within those areas assessed. In addition no state listing or identified TMDL exists within Carroll County related to litter and floatables. Therefore, a problem with litter and floatables is not an identified concern in Carroll County, as it relates to this permit.

Carroll County implements several programs to reduce and control litter along roadways, which ultimately reduces litter to County waterways:

- Eleven groups actively volunteer to pick up trash along an individually designated mile stretch of roadway once in the fall and once in the spring, as part of the Carroll County DPW Adopt-A-Road program. This program was initiated to control and reduce litter on Carroll County's roads and invites public, individual, and civic group volunteer participation. This program is promoted through an online video entitled, "A Cleaner Carroll" found on the Roads Operations' webpage. Equipment is provided along with safety guidelines and tips on how to pick up trash along roadways for disposal at the County's Resource Recovery Facility. Signs recognizing individual or group efforts in helping keep Carroll clean are provided by the County. Additionally, the Bureau of Facilities provides trash/ litter and recycling receptacles at facilities where they are considered practical.
- DPW staff spent 718 hours on roadside trash pickup in FY 2018. An additional 400 hours were spent by trustees from the Sheriff's Office picking up trash. Hours provided by the Sheriff's Office are variable depending on the trustees.
- Trash nuisance remediation is primarily complaint driven and site or address specific. Contractors hired by the Carroll County DPW's Roads Operations abate the trash. In FY 2018, 47 complaints were received, and 5 sites were abated by County contractors.
- The program for the County and the municipalities includes a combination of trash receptacles along streets and in parks, litter ordinances, street sweeping, trash and

recycling collection service, litter collection along roads and in public spaces, trash guards at storm drain inlets, and public education through newsletters, websites, social media, radio, television/cable, informational materials, and special events. Special events include, but are not limited to, clean-up days with local college volunteers and Boy Scouts, festivals, and fairs.

Carroll County has developed and implemented a public education and outreach program to reduce littering and increase recycling, actively seeking to divert waste from the landfill. As seen in **Figure 2**, recycling participation in Carroll County was on the rise from 2008 to 2013. The drop in recycling from 2013 to 2014 can partially be attributable to the County's waste diversion efforts, which result in less waste to recycle. This decrease may also be partially due to the increasing costs of recycling to the companies that use the recycled materials, which, among other factors, has pushed down the market demand. Recycling markets have tightened up, and recovered material is being scrutinized for contamination. A significant percentage (60%) of U.S. recyclables has been exported to China in the past. However, the Chinese Government announced a plan to ban all recovered material imports by 2020. China's initiatives would impose stricter quality standards for materials entering its ports and set deadlines for material bans.

In 2017, Carroll County began the process of eliminating the collection of plastic grocery shopping bags to the curbside collection. These bags create problems for the machinery, and the Material Recovery Facility (MRF) has to shut down the process to clean out the plastic from the equipment. All recycling is now required to be loose and not in plastic bags. Plastic grocery bags that are collected must go back to the supermarket or retail outlets that have their collections in the front of their store. As a result, Carroll County is encouraging residents "when it doubt, throw it out and not in the recycling bin" to improve the quality and viability of recovered recyclable materials.

Options for both curbside and drop-off opportunities have increased, as has the type of materials that can be recycled. While pick-up of recyclables within municipalities is provided by each individual municipality, the County's recycling public education and outreach efforts are implemented countywide, including within the municipalities.

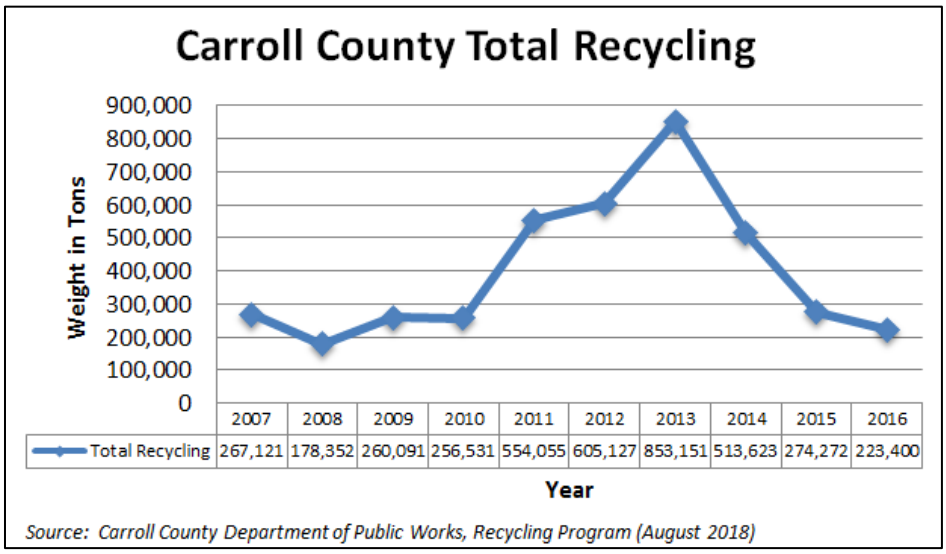


Figure 2: Total Recycling

Curbside, single-stream recycling was implemented in 2007 (and expanded in 2008), making it easy and convenient for residents to participate. Most standard household recycling can simply be placed at the curb. Carroll County has taken advantage of grant opportunities to purchase and distribute large recycling containers that add to the ease of handling curbside recycling.

Carroll County's Recycling Operations staff offers voluntary recycling opportunities for all Carroll County residents and businesses. Licensed haulers are required to offer all of their customers a curbside recycling service. For residents or businesses who wish to haul their own waste and recyclables to the landfill, the County provides a drop-off site for waste and a full-service Recycling Center at the Resource Recovery Park plus a drop-off site at Hoods Mill Landfill. Carroll's Resource Recovery Park is conveniently located in the center of the County. There is no charge for recycling.

The Recycling Center accepts all materials recycled through the County's curbside program plus many items that are not eligible for curbside pickup such as textiles, polystyrene foam, rigid plastics, electronics, CD/DVD cases and disks, car and truck batteries, used motor oil, antifreeze, waste oil, cooking oil, as well as aluminum can reimbursement. Aluminum can reimbursement fluctuates with the market value. The Resource Recovery Park also accepts white goods/scrap metal for recycling. The Loading Dock offers recycling of reusable building materials onsite.

Hampstead, Manchester, Mount Airy, Sykesville, and Westminster provide bulk trash pick-up to encourage proper disposal of trash and debris to help promote better water quality. In addition, multiple municipalities have an oil, antifreeze, and/or gasoline recycling program managed by either the municipality or Maryland Environmental Service (MES) at a municipal facility or MES facility.

Since 1994, the County has banned yard waste from being mixed with household waste for disposal or in plastic bags. Citizens countywide can dispose of grass, leaves, and branches in the yard waste area of the Resource Recovery Facility. These items are mulched by a third party. Several municipalities offer curbside yard waste pickup.

Citizens are encouraged to consider backyard composting. The County provides an opportunity to purchase compost bins and rain barrels at a discounted rate in the spring. Public education materials have been created and are provided at events and on the website.

The Carroll County Recycling Office offers a semi-annual household hazardous waste collection to ensure household chemicals are properly discarded. The Carroll County Recycling Office diligently works to inform citizens and instill the "Reduce, Reuse, Recycle!" theme.

In 2014, the Maryland General Assembly passed Senate Bill 781, Environment – Recycling – Special Events. The law requires organizers of special events meeting certain criteria to provide a recycling receptacle adjacent to each trash receptacle, ensure recycling receptacles are clearly distinguished from trash receptacles, and ensure that recycled materials are collected for recycling. Special event organizers must conduct recycling in accordance with the County's Ten-Year Solid Waste Management Plan. The law also required each County to update its plan by October 2015 to address the collection and recycling of recyclable materials from special events.
In FY 2018, the County hosted several "Reduce, Reuse, Recycle!" public outreach efforts as explained below.

1. Two residential household hazardous waste drop-off events took place on October 21, 2017, and May 12, 2018. Events such as these provide County residents with a safe means for:
   - disposing of household chemicals;
   - shredding of unneeded documents; and
   - learning about measures to protect the environment.
2. County residents were encouraged to dispose of unused prescription and non-prescription drugs at designated law enforcement agencies in the County.
3. The County hosted a rain barrel and compost bin sale event on April 18, 2018, to provide rain barrels and composting bins to residents at a reduced cost.

Through all recycling efforts, the County has achieved a 57.54 percent recycling waste diversion rate that included a 5 percent source reduction credit in 2015 (based on MDE's Recycling Report). The State-mandated recycling rate is 35 percent (as of December 31, 2015).
To proactively address changing and future solid waste needs, a Solid Waste Work Group evaluated options and prepared a report with recommendations. A Solid Waste Advisory Council (SWAC) was subsequently established by the Board of County Commissioners in 2014 to help implement recommendations of the various solid waste plans and advise staff. The SWAC continues to meet regularly.

The Recycling Office hosts a webpage entitled "Recycling" which provides extensive public education materials and opportunities (www.recyclecarroll.org). The homepage provides general information and materials on recycling, as well as information targeted to recycling in the home, at schools, and for businesses. All recycling events are posted on the website, and related educational materials and documents are posted and available for download. The Recycling Office also hosts a Facebook page for followers to receive regular information and updates.

In addition to the "Reduce, Reuse, Recycle!" events, information is given out to residents about hard to recycle items such as CFL bulbs, pharmaceuticals, kitchen grease, and latex paint. Recycling program staff also attends many festivals and community events where an educational booth and materials are provided and staff is available to answer questions.

In addition to all the educational materials available on the Recycling website and at events, information is routinely disseminated to the public through mailers, advertisements in local print media, local cable channels, and local radio stations.

The Recycling staff coordinates closely with Carroll County Public Schools (CCPS) and Carroll Community College to address the requirements of House Bill 1290 – Environment – Recycling – Public School Plans (2009) to implement a strategy for collecting, processing, marketing, and disposing of recyclable materials from public schools. Single-stream recycling was implemented at schools and in residential communities. Various types of collection containers, provided by CCPS, are available throughout the schools. The Carroll County Board of Education is responsible for the administration of the program in all public schools along with its contracts for trash and recycling services.

Additionally, County Recycling staff partners with the CCPS STEM (Science, Technology, Engineering, & Math) programs each year to educate and engage students, usually in elementary school, on issues related to recycling that coincide with the curriculum. This program is available upon request by a school.

The Maryland Recycling Act (MRA) required all counties with populations over 150,000 to recycle 35 percent of the waste generated by December 31, 2015. In addition, Maryland established a voluntary waste diversion goal of 60 percent and a voluntary recycling rate of 55 percent by 2020. The waste diversion goal is comprised of the recycling rate plus source reduction credits (maximum 5 percent) that Maryland counties and Baltimore City earn through activities designed to reduce the amount of waste going to the waste stream.

Carroll County continues to exceed the State goal for recycling and receive the maximum credit for waste diversion. Despite the challenges of the recycling market, recycling rates are climbing in the County. In addition, the County continues to provide extensive public outreach efforts and events to promote "Reduce, Reuse, Recycle!" These programs and events continue to provide opportunities to divert waste from the landfills as well as encourage continued recycling and litter control.

Figure 3, "Carroll County MRA Recyclables," and **Figure 4,** "Carroll County Recycling & Waste Diversion Rates," demonstrate the trend in both the recycling weight and rates, respectively, in Carroll County from 2007 to 2016 (2017 data not yet published by MDE). Recycling of MRA recyclables in Carroll County rose steadily from the start and expansion of the program in 2007 and 2008. However, falling oil prices, a strong U.S. dollar, and a weakened economy in China have caused the national and global industry to take a significant downturn since 2011. This downturn has impacted Carroll's recycling market as well. These market conditions, which are beyond the County's control, have subsequently impacted Carroll's recycling rates for MRA recyclables. Although the County is currently paying to dispose of the

recyclables, the County continues to encourage recycling to reduce the waste stream to the landfill, and the recycling rate (as shown in Figure 4) is on the rise since 2012.

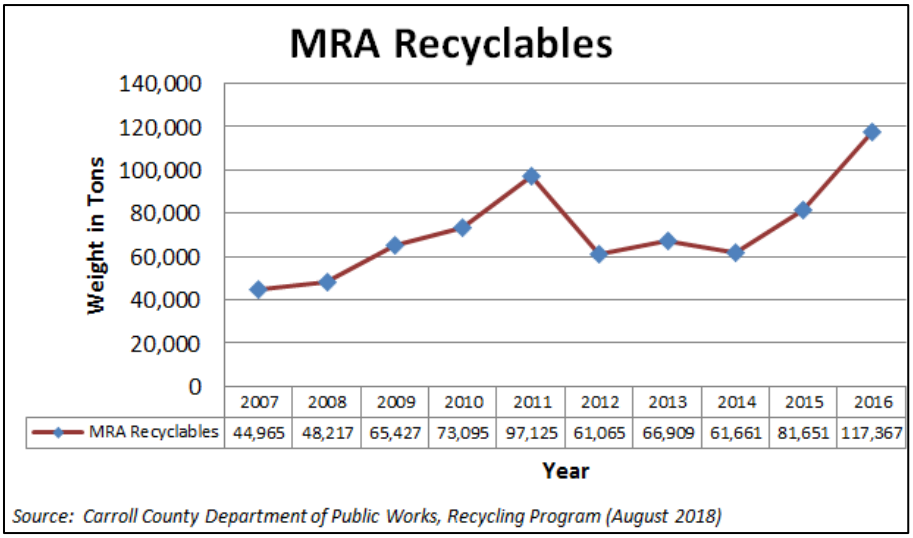


Figure 3: Carroll County MRA Recyclables

Figure 4, "Carroll County Recycling & Waste Diversion Rates," shows the rate of MRA recycling as well as the waste diversion rate. The source reduction credit is reflected in the waste diversion rate (added to the recycling rate).

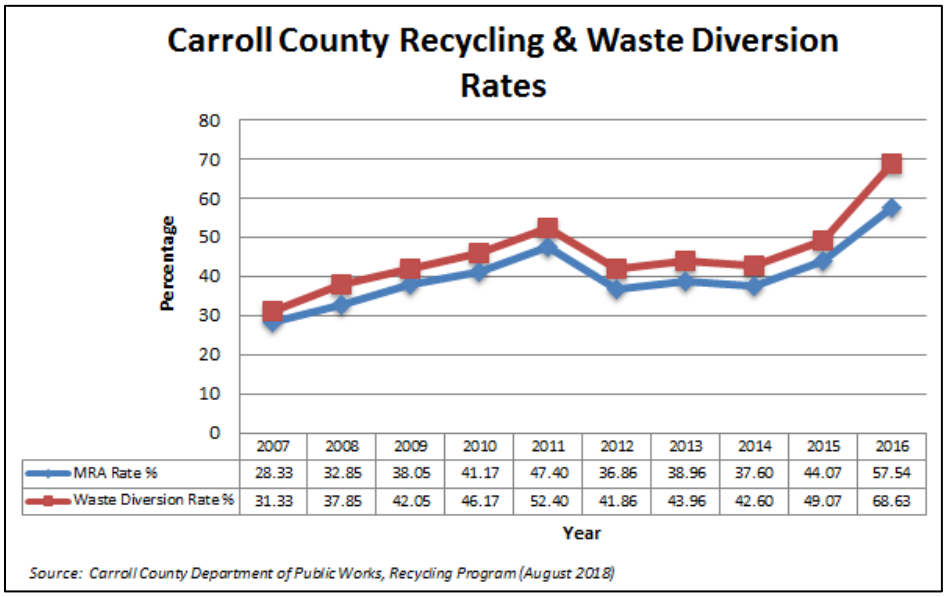


Figure 4: Carroll County Recycling & Waste Diversion Rates

Non-MRA recyclables may include automobile components, construction/building materials, and other materials. The County's MRA recycling rate has decreased since 2011, which is subsequently reflected in the drop in total recycling from 2013 to 2014. However, overall, the County's total recycling still reflects an increase between 2007 and 2016 and is still meeting the

35 percent recycling rate required by the MRA (see **Figure 2).** This success continues to divert waste from the landfills. The decrease in total recycling overall from 2013 to 2014 is likely due, in part, to the County's waste diversion efforts, resulting in less available resources to recycle.

The County DPW's Bureau of Roads Operations has an "Adopt A Road" program to control and reduce litter on Carroll County's roads, which invites public, individual, and civic group volunteer participation. The program is promoted through an online video entitled "A Cleaner Carroll" found on the Roads Operations' webpage. Equipment is provided along with safety guidelines and tips on how to pick up trash along roadways. Signs recognizing individual or group efforts in helping keep Carroll clean are provided by the County. Additionally, the Bureau of Facilities provides trash and litter receptacles at facilities where they are considered practicable.

5. Property Management and Maintenance

The permit requires a Notice of Intent (NOI) submitted to MDE for each County-owned municipal facility requiring NPDES stormwater general permit coverage. **Table 4** lists those facilities owned by County or municipal co-permittee requiring current 12SW permit registration.

The permit also requires that the status of stormwater pollution prevention plan (SWPPP) development and implementation for each facility be reviewed, documented, and submitted to MDE annually. **Table 5** reflects each facility manager's response with respect to their facility's SWPPP status. A total of 247 employees participated in 12SW/SWPPP training at their facilities.

Table 4
Carroll County Co-Permittees – 12SW General Stormwater Industrial Permit Status

County or Municipal Owned Facility	Review Applicability	SWPPP Submitted to MDE	NOI Submittal Date	MDE REGISTRATION
County Regional Airport	8/25/2017	Yes	June 30, 2014	MDE Registration Effective Date 08/11/2014 12SW1755/MDR001755
County Maintenance Center	9/07/2017	Yes	June 30, 2014	MDE Registration Effective Date 08/11/2014 12SW1861/MDR001861
County Northern Municipal Landfill	8/16/2017	Yes	June 30, 2014	MDE Registration Effective Date 08/11/2014 12SW0660/MDR000660
County Hoods Mill Landfill (Convenience Drop-off)	8/16/2017	Yes	June 30, 2014	MDE Registration Effective Date 08/11/2014 12SW0661/MDR000661
Hampstead – Public Works Gill Maintenance Shop	8/09/2017	Yes	June 16, 2014	MDE Registration: 07/30/14 12SW2213 / MDR002213
Manchester Public Works Maintenance Shop	7/31/2017	Yes	May 5, 2014	MDE Registration: 06/04/14 12SW2201/MDR02201
Mount Airy Public Works Maintenance Shop	8/17/2017	Yes	June 6, 2015	MDE Registration: 06/24/15 12SW2257/MDR002257
Mount Airy Public Works WWTP	8/17/2017	Yes	March 30, 2015	MDE Registration: 04/10/15 12SW2258/MDR002258

Taneytown Public Works Maintenance Facility	8/11/2017	Yes	June 16, 2014	MDE Registration: 07/17/14 12SW2263 / MDR001743
Taneytown Public Works WWTP	8/11/2017	Yes	June 16, 2014	MDE Registration: 06/26/14 12SW1743 / MDR001743
Westminster Public Works Streets Maintenance Shop	8/10/2017	Yes	March 31, 2014	MDE Registration: 06/26/14 12SW2292/MDR002292
Westminster Public Works WWTP	8/10/2017	Yes	July 3, 2014	MDE Registration: 08/14/14 12SW2252 / MDR002252
Westminster Public Works Utilities	8/10/2017	Yes	June 17, 2014	MDE Registration: 07/28/14 12SW2455 / MDR002455

Jurisdictions having facilities with 12SW permits listed in **Table 5**, are responsible for developing and maintaining their SWPPPs which include non-structural BMP/good housekeeping practices. These practices may include proper materials storage, fuel management practices, recycling, secondary containment, spill kits, and spill control measures. Quarterly routine inspections of the site include storm drain system infrastructure. Visual grab samples, personnel training, and annual evaluations continuously improve on-site pollution prevention effectiveness. Carroll County Regional Airport (CCRA) has an Oil Operations permit issued by MDE requiring the facility to implement a *Spill Prevention Control and Countermeasures Plan* (SPCC) submitted to MDE as part of the renewal application and inspection process.

Table 5
MS4 Co-Permittee – 12SW General Stormwater Industrial Permit
SWPPP Status (During MS4 Permit Reporting Year)*

Facility	SWPPP Plan Current *Y/N*	SWPPP Implemented *Y/N*	Facility Employees Trained *Y/N / #*	Training *Date(s)*	SWPPP Routine Inspections & Visual Grab Samples Performed *Y/N*	SWPPP Annual Comprehensive Evaluation Performed and Certified *Y/N*	Annual Comprehensive Evaluation Report Prepared and Posted in SWPPP *Date*
County Regional Airport	Y	Y	Y/2	10/27/17	Y[1]	Y	9/6/17
County Maintenance Center	Y	Y	Y/151	12/5/17	Y	Y	3/20/18
Northern Municipal Landfill	Y	Y	Y/9	10/11/17	Y	Y	10/25/17
Hoods Mill Landfill (Convenience Drop-Off)	Y	Y	Y/9	10/11/17	Y	Y	10/25/17
Hampstead – Public Works Gill Maintenance Shop	Y	Y	Y/8	12/6/17	Y	Y	12/6/17
Manchester Public Works Maintenance Shop	Y	Y	Y/6	7/20/17	Y	Y	6/5/18
Mount Airy Public Works Maintenance Shop	Y	Y	Y/5	12/1/16 10/27/17	Y	Y	10/17/17
Mount Airy Public Works WWTP	Y	Y	Y/5	12/1/16 10/27/17	Y	Y	10/17/17
Taneytown Public Works Maintenance Facility	Y	Y	Y/7	9/6/16 10/27/17	Y	Y	7/6/18
Taneytown Public Works WWTP	Y	Y	Y/2	9/6/16 10/27/17	Y	Y	7/6/18
Westminster Public Works Streets Maintenance Shop	Y	Y	Y/18	12/13/17	Y	Y	12/22/17
Westminster Public Works WTTP	Y	Y	Y/13	12/11/17	Y	Y	3/14/18
Westminster Public Works Utilities	Y	Y	Y/12	12/15/17	Y	Y	11/1/17

*Status reported by jurisdiction/facility.
[1] Partial grab samples completed with no prior issues. Frequency self-corrected by facility.

The permit requires the County to continue to implement a program to reduce pollutants associated with maintenance activities at County-owned facilities, including parks, roadways, and parking lots. County and municipal co-permittees under the MS4 permit, in a cumulative effort, reduce pollutants thru best management practices (BMPs) implemented in various maintenance activities. NPDES Stormwater Pollution Prevention and IDDE training is provided annually to County, municipal managers, and DPW supervisory level staff. Training includes BMPs for non-hazardous spill or leak containment and clean-up, and procedures for reporting to the appropriate authorities.

County-owned facilities including parks, roadways, and parking lots are maintained by numerous bureaus under the Carroll County DPW. The Bureau of Facilities provides general maintenance for over 40 County-owned properties ranging from administrative to maintenance of park facilities. The County's fleet maintenance operation includes a garage/shop, fuel island area, fleet wash facility, and warehouse all managed and maintained by the Bureau of Fleet Management/Warehouse using applicable best management practices including auto fluid recycling. The Bureau of Roads Operations provides routine maintenance of the roads including roadside mowing, pavement patching, pavement line striping, drainage work, pipe cleaning and replacement, tree trimming and removal, storm drain maintenance and repair, and surface sealing operations for approximately 988 miles of predominantly rural open section roadways (923 miles paved/65 miles gravel), 154 bridges, and salt dome facilities. CCRA, with a 5,100-foot runway, supporting tarmac, and small parking lot is maintained by the DPW Airport Operations. Access roads and parking lots for the water and wastewater treatment plants and their small maintenance facility are maintained under the Bureau of Utilities. The Bureau of Solid Waste maintains access roads to and from the County's active landfill and convenience drop-off location. The Department of Recreation and Park's, Bureau of Parks maintains facilities for three natural resource-related parks, while the Department of Economic Development provides maintenance for the Carroll County Farm Museum tourism venue. See **Table 6:** MS4 Permittee Reported Pollution Reduction Activities Associated with Facility Maintenance Activities for permittee maintenance pollution reduction efforts.

Table 6
MS4 Permittee Reported Pollution Reduction Activities Associated with Facility Maintenance Activities (Parks, Roads, Parking Lots, etc.)

	Street Sweeping (1)		Inlet Inspection and Cleaning (1)		Integrated Pest Management practices used to reduce the use of pesticides, herbicides, fertilizers, and other pollutants associated with vegetation management		Reducing use of deicing materials through research, continual testing and improvement of materials, equipment calibration, employee training, and effective decision making.		Ensuring staff receives adequate training in pollution prevention and good housekeeping practices	
Total MS4	✓		✓		✓		✓		✓	
Carroll County	✓	Roads/Facilities (6)	✓	(7,8)	✓	(2,10)	✓	(11,12,13,14)	✓	(3)
	✓	Solid Waste (4,5,6)			✓	(10)	✓	(11,12,13)	✓	(3)
		Airport	✓	(9)	✓	(2,10)	✓	(11,12)	✓	(3)
		Parks	✓	(8)	✓	(10)	✓	(11,12)		
		Farm Museum	✓	(4,9)	✓	(2,10)	✓	(11,12,13)	✓	(3)
Hampstead	✓	(3,6)	✓	(9,3)	✓	(2,10)	✓	(11,12,13)	✓	(3)
Manchester	✓	(3,6)	✓	(9,3)	✓	(2,10)	✓	(11,12,13)	✓	(3)
Mount Airy	✓	(3,6)	✓	(9,3)	✓	(2,10)	✓	(11,12,13)	✓	(3)
New Windsor	✓	(6)	✓	(7,8)	✓	(2,10)	✓	(11,12)	✓	(3)
Sykesville	✓	(6)	✓	(8,9)	✓	(2,10)	✓	(11,12)	✓	(3)
Taneytown	✓	(3,4,6)	✓	(7,8)	✓	(2,10)	✓	(11,12,13)	✓	(3)
Union Bridge	✓	(5,6)	✓	(7,8)	✓	(2,10)	✓	(11,12)	✓	(3)
Westminster	✓	(3,4,5,6)	✓	(7,8)	✓	(2,10)	✓	(11,12,13,14,15)	✓	(3)

(1) Restoration credits applied when approved Alternative BMP parameters met.
(2) No fertilizer usage reported in vegetation maintenance practices. Herbicide usage reported.
(3) Annually
(4) Monthly
(5) Weekly
(6) As Needed – Construction, Emergencies, and after Special Events
(7) Visual/Daily Maintenance Activities
(8) As Needed - Complaints or Clogging
(9) Visual/Scheduled
(10) Mechanical control primarily used for vegetation management, ie. mowing/hand trimming, etc.
(11) Training, Research or technical Information
(12) Visual observations/effective decision making
(13) Equipment calibration
(14) Salt Brine / Pre-Treatment
(15) Dry Salt/Salt Brine Mix (lower temp activation and less bouncing off road)

Street Sweeping

Street sweeping maintenance programs are implemented in numerous municipal co-permittee urban and suburban areas covered by the permit as shown in **Table 6**. Carroll County does not have a street sweeping program for their predominantly rural open section roadways. The County Bureau of Solid Waste sweeps weekly at the Northern Landfill and monthly or as needed, at the Hoods Mill residential drop-off facility. Approximately 1,088 linear miles of streets were swept countywide. These services are performed by a combination of County, municipal operations, and contractors. Municipal co-permittees typically prioritize road

selections for street sweeping on downtown commercial business districts and higher density residential zoned areas with known heavier traffic patterns expanding out through primary ingress and egress street routes to commercial and residential suburb areas. Street sweeping also occurs in all permittee jurisdictions as a BMP when necessary for emergency management, construction-related activities, or after special events.

Inlet Inspection and Cleaning

All permittees conduct regularly scheduled, complaint-driven, or clog-driven inlet inspections and clean-out programs. A total of 851 storm drain inlets were cleaned countywide through manual, vacuum, or a combination of both cleaning methods during the permit reporting year. **Table 6** shows each permittee's pollution reduction efforts associated with maintenance activities.

Reducing the Use of Pesticides, Herbicides, Fertilizers, and Other Pollutants Associated with Vegetation Management through Increased Use of Integrated Pest Management

Carroll County and all co-permittees employ Integrated Pest Management (IPM) practices to reduce herbicide usage associated with vegetation management primarily through mechanical control. The County's Bureau of Facilities, which manages over 40 properties, utilizes an IPM program resulting in efficient, minimal, and/or no usage of chemical materials in maintenance and weed control management practices. The bureau's strategy is to rely on pre-emergent selective herbicides and minimize post-emergent non-selective products. No fertilizer usage for vegetation maintenance purposes was reported by all permittees for the permit year. Pollution reduction efforts at park venues managed by the Bureau of Parks only use mechanical controls for vegetation management. The CCRA facility has reduced the use of herbicides for vegetation management through increasing mechanical control methods and minimizing application area. The overall management of noxious weed occurrences along County road rights-of-way and on private properties is implemented via an agreement with the Maryland Department of Agriculture (MDA). Employees from MDA perform spot spraying along County rights-of-way as well as private lands. Related herbicide usage for this application is reported through MDA. Pollution reduction efforts are noted in **Table 6** and in the MS4 Geodatabase Chemical Application table.

Deicing Materials

The management of roadway deicing material distribution and applications is the responsibility of all permittees within their legal jurisdictional boundaries. Carroll County Roads Operations has installed "Limit of Maintenance" signs marking these jurisdictional lines for road crews to follow for efficient but effective salt applications for public safety.

Permittees reduce the use of winter weather deicing materials through research, continual testing and improvement of materials, equipment calibration, and/or employee training as shown in **Table 6** and the MS4 Geodatabase Chemical Application table. Research and materials, salt management, and equipment calibration are periodically covered in training. All permittee jurisdictions have been provided with a copy of the SHA's salt management program/plan and other salt management technical resources.

The County Roads Operations Bureau responds to emergency situations such as snowstorms, flooding, downed trees, and vehicle accidents. The County is divided into 50 snowplow routes. Carroll County employs SOPs that include BMPs for salt management that cover the use of salt from its delivery, storage, and handling at salt storage locations to its placement on roadways during winter storms and post-storm cleanup operations. These practices are reviewed at an annual snow season training event that includes calibration of salt truck equipment for both County and contractor trucks.

The County and municipalities manage their salt storage facilities through employee training and the use of good housekeeping BMPs that include sweeping up residual materials into the salt storage structures. On-site spill kits are available at each facility in case of equipment failure during loading operations. In the County, the increased use of salt brine is utilized whenever feasible for pre-wetting of road surfaces in advance of winter storm events forecasted by national and local winter weather advisory sources. Snow plowing and salt application procedures are designed to limit the number of necessary passes to prevent overlapping and over usage of deicer materials.

Every storm event is treated as a unique event with decisions made based on actual conditions. Pollution reduction measures include area supervisors performing real-time road inspections to determine if application rates are sufficient and efficient to deliver the best road conditions possible for public safety in a cost-effective manner and in the most environmentally sound manner, when practicable. Gravel roads do not receive deicer applications. Stone applications are provided as needed to improve traction. Citizen information is provided on the Roads Operations' webpage entitled "Clearing The Way Through Carroll County Efficiently," which provides instructions for the public that will help salt crews limit the number of return passes necessary to clear roadways and reduce the amount of salt applications. Staff researches materials, methods, and technologies and attends national and regional seminars and local workshops when possible to stay current on winter road maintenance practices and affordable deicer/chemical technologies with reduced environmental impact.

Deicers are used at pertinent facilities when winter weather conditions affect public and employee safety. Appropriate applications of chemicals are used at facilities having year round usage but not where facilities are inactive during the winter season, which is a pollution reduction practice. These actions result in the reduction of salt in solid form in everyday practice. A significant increase in storm events and colder climatic conditions resulted in an increase in deicer use for the MS4 during the permit year. Carroll County schools were closed for six days during a particularly bad winter.

Proper management of snow and ice at CCRA is essential for safe winter operations. This includes aircraft and support equipment movements during servicing, taxiing, and takeoff. Ensuring safe conditions on the tarmac for outside boarding of passengers, flight crews, and maintenance ground personnel activities is crucial. No de-icing of aircraft is performed at the facility, thereby reducing potential pollutants. Additionally, keeping ahead of winter storm events through using proper mechanical practices minimizes chemical usage until conditions necessitate the use of deicers in dry form. Effective decision making with regard to deicer usage is facilitated through Federal Aviation Administration (FAA) regulations and guidelines, national

and local winter weather warning and forecast information, regular surface winter condition inspections, and good communication between experienced Fixed Base Operator (FBO) and CCRA airport management personnel. Research for effective, economical deicers that reduce pollutants includes keeping current with industry-related technical resource bulletins and information.

Staff Training

A total of 284 employees were trained under the NPDES MS4 permit for Carroll County. Each fall an annual NPDES MS4 permit training workshop event is held for pertinent County and municipal co-permittee managerial and supervisory staff who oversee maintenance activities within their agencies or jurisdictions. The annual workshop was held on October 27, 2017 at the Carroll County Public Safety Training Center, Westminster, MD.

Topics included:

- NPDES MS4 Permit Overview and Regulatory Update
- Employee Training: A Key to Successful Stormwater Compliance
- MS4 Illicit Discharge Detection and Elimination
  - Preventing Stormwater Pollution: What You Can Do
  - IDDE Overview: Screening, Visual Survey, Reported Incidents
  - IDDE Investigations
- MDE: Underground Injection Control Program (UIC)
- MS4 Watershed Restoration Projects
- Utility Infrastructure Technology
- 12SW Permit Implementation at the Northern Landfill
- MS4 Property Management and Maintenance
  - 12SW Permit Status and Renewal
  - BMP Pollution Reduction Efforts/Maintenance Activities
  - CC PMM Resource Guide – BMPs, Record Keeping and Reporting

Permittees ensure their pertinent public works maintenance staffs are trained in municipal stormwater pollution prevention and good housekeeping/BMP practices, IDDE and 12SW SWPPP training for permitted facilities. Of 284 total employees trained under the Carroll County MS4 for the permit year, 270 were maintenance staff.

The Carroll County Department of Land and Resource Management maintains a guidance document entitled: "Carroll County MS4 Property Management and Maintenance Resource Guide, *Municipal Stormwater Pollution Prevention Guidance* for MS4 Co-Permittee Personnel" designed to provide practical user friendly resources to maintenance staff that includes both the IDDE manual and the *Carroll County MS4 Pollution Prevention Maintenance BMP Guidance Manual* for the purpose of reducing pollutants associated with municipal facilities. This overall guidance manual also includes sections on Training, 12SW Inspections/Evaluations, and Reporting.

6. Public Education

The permit requires Carroll County to continue to implement a public education and outreach program to reduce stormwater pollutants. Outreach efforts may be integrated with other aspects of the County's activities.

Hotline

The permit requires maintenance of a compliance hotline or similar mechanism for public reporting of water quality complaints, including suspected illicit discharges, illegal dumping, and spills. Individuals are encouraged to report any evidence of illicit discharge or illegal dumping. Citizens throughout the County can call the non-emergency Stormwater Pollution Prevention Hotline at 410-386-2210.

Webpages

Carroll County LRM hosts several webpages that provide materials and resources to local residents and businesses.

A dedicated NPDES webpage entitled "Protecting Carroll County Waters" (http://ccgovernment.carr.org/ccg/npdes/) is the primary source of information related to the NPDES MS4 permit. The webpage describes basic information regarding actions the average property owner may take to help prevent stormwater runoff pollution. The page also features the Pollution Prevention Hotline, which is readily visible, to be used for non-emergency concerns. This page also provides helpful links and documents available to download including, but not limited to, 2012 to 2017 annual reports, various EPA and MDE NPDES-related websites, and educational brochures and materials.

The NPDES webpage housed under the Bureau of Resource Management's (BRM) website describes some of the basic permit requirements and terms, provides the same basic pollution prevention information found on the "Protecting Carroll County Waters" webpage, and provides another location at which the public can access the 2012 to 2017 annual reports (http://ccgovernment.carr.org/ccg/resmgmt/).

The BRM's website provides further information regarding the County's and municipalities' stormwater program and County and municipal contacts. Educational materials for both children and homeowners are available for viewing or download. The BRM webpage describes the various agricultural and urban BMPs. Copies of the Bureau's quarterly newsletter, *Down to Earth*, are available on the webpage which include educational information and reporting on stormwater activities and program implementation. The Stormwater Pollution Prevention Hotline and emergency numbers are duplicated on this website.

The "Water Resource Coordination Council" (WRCC) webpage http://ccgovernment.carr.org/ccg/lrm/wrcc/ provides access to the resolution creating the Council. The Memorandum of Agreement (MOA) and Memorandum of Intent (MOI) prescribing the coordination between the County and municipalities are also available for download.

The Carroll County "Environmental Advisory Council" (EAC) webpage (http://ccgovernment.carr.org/ccg/eac/) provides access to materials related to stormwater pollution, TMDLs, recycling and waste reduction, and other relevant environmental topics. All presentations are posted on the webpage for public access and viewing. Reports and information related to relevant projects completed and topics discussed by the EAC are available to view as well. These include links to EAC-sponsored business and general public stormwater workshops and public education materials developed.

The webpage, "Workshop: Homeowners & Stormwater," provides information on previous and upcoming workshops designed to equip Carroll County homeowners and residents with knowledge regarding how to minimize stormwater runoff and prevent stormwater pollution from residential properties. Materials and resources related to stormwater pollution prevention and past workshop presentations are available for viewing by the public as well. (http://ccgovernment.carr.org/ccg/npdes/homeowner/)

The webpage, "Workshop: Carroll County Businesses for Clean Water," provides information on previous and upcoming workshops designed to equip Carroll County businesses with knowledge of the good housekeeping and BMPs that will protect water quality and prevent issues for these businesses in the future. Materials related to stormwater pollution prevention and past workshop presentations are available for viewing by the public as well. (http://ccgovernment.carr.org/ccg/npdes/workshop/)

The Carroll County Recycling Office hosts a webpage, entitled "Recycling," (recyclecarroll.org) which provides extensive public education materials and opportunities). The homepage provides general information and materials on recycling, as well as information targeted to recycling in the home, at schools, and businesses. All recycling events are posted on the website, and related educational materials and documents are posted and available for download. The Recycling Office also hosts a Facebook page for followers to receive regular information and updates. Public Service Announcements are periodically run on WTTR, the local radio station.

All of the municipalities host websites that include links to the relevant Carroll County webpage(s), various publications, and municipal newsletters.

Materials and Publications

All permittees provide stormwater pollution prevention materials at their municipal offices, at the Carroll County Office Building, on their websites, through social media, and at various events held throughout the year.

The "Protecting Carroll County Waters" webpage (http://ccgovernment.carr.org/ccg/npdes/) includes resources related to the regulated community. Miscellaneous information, links, and materials are available. Brochures are available that describe good housekeeping practices applicable to specific types of businesses that tend to be more vulnerable to having illicit discharges. The materials are provided at public events and workshops, available online, and provided to property owners during visual inspections and courtesy visits.
The BRM produces a quarterly newsletter, *Down to Earth*, which is available on the website, emailed to recipients via a database of interested parties, and available in hardcopy in multiple

locations. The newsletter content includes educational articles for the general public, as well as updates on stormwater projects and events and other relevant happenings.

Each municipality also produces a regular newsletter for its citizens. Municipal newsletters also periodically share event information, educational content, and other material relevant to stormwater pollution prevention. The Town of Hampstead included information in the April-July 2018 newsletter about keeping storm drains clean.

Events

All permittees participated during the permit year in outreach efforts associated with a 12 SW and 12 SR NPDES Stormwater Permit Workshop , which was held February 16, 2018. In addition, storm drain stenciling is implemented throughout the County and is often coordinated as a volunteer or outreach event. A complete listing of specific FY 2018 events can be found in **Table 7**.

Table 7
Carroll County NPDES Phase 1 MS4 Public Outreach Events

Event	Date	Watershed(s)	Description
Carroll County Employee Appreciation Day	May 16, 2018	◆ Multiple	Booth – recycling materials and direct discussion w/ attendees
Carroll County Household Hazardous Waste Spring Clean-Up	May 12, 2018	◆ Multiple	The County hosted an event to allow homeowners to drop off hazardous household materials, which keeps them from being dumped down the drain on in the yard. In addition, paper shredding was offered and the shredded paper recycled.
Westminster Flower & Jazz Festival	May 12, 2018	◆ Multiple	Booth – materials and direct discussion w/ attendees
Charlotte's Quest Nature Center Spring Fest	May 6, 2018	◆ Prettyboy Reservoir ◆ Double Pipe Creek ◆ Liberty	Booth – materials, interactive stormwater pollution prevention game, and direct discussion w/ attendees. Recycling also was provided.
Choose Clean Water Coalition MPDES MS4 Tour	May 3, 2018	◆ Multiple	Non-profit environmental groups were invited to spend a day with LRM staff learning about Carroll County's implementation of MS4 permitting requirements and touring BMP installation/facilities.
Sykesville Annual Spring Clean Up Day	April 22, 2018	◆ South Branch Patapsco	Stream bank cleaning
New Windsor Town Beautification Day	April 28, 2018	◆ Double Pipe Creek	Cleaned up streams of trash and stenciled inlets.
Rain Barrel & Composting Event	April 21, 2018	◆ Multiple	The County hosted a rain barrel and composting event to provide rain barrels and composting bins to residents at a reduced cost.
Longwell Run Earth Day Celebration & Tree Planting	April 11, 18, and 26, 2018	◆ Double Pipe Creek	Consisted of planting the bio retention facility, stormwater education at the SWM ponds, tree planting along the stream (outreach to 230 Outdoor School students from East Middle School), micro –invertebrate education, and identification to determine stream health.
Carroll County Seniors on the Go Expo	April 4, 2018	◆ Multiple	Booth – materials and direct discussion w/ attendees
Carroll County Home Show	April 14, 2018	◆ Multiple	Booth – materials and direct discussion w/ attendees
Hampstead-Manchester Business & Community Expo	March 10, 2018	◆ Multiple	Booth – materials and direct discussion w/ attendees
12SW/SR Permittee Workshop	February 16, 2018	◆ Multiple	Workshop – permittees learned about topics related to compliance – MDE staff participated
Carroll Arts Council Festival of Wreaths	November 23-December 2, 2017	◆ Multiple	Booth – materials and direct discussion w/ attendees
America Recycles Day	November 15, 2017	◆ Multiple	Booth – materials and direct discussion w/ attendees
Carroll County NPDES MS4 Permit Annual Stormwater Pollution Prevention Compliance Training	October 27, 2017	◆ Multiple	Training was provided to key management, supervisory, and assistant supervisory level personnel responsible for NPDES stormwater permit regulations, requirements, and implementation for both the County and the municipalities.

Carroll County Household Hazardous Waste Fall Clean-Up	October 21, 2017	◆ Multiple	The County hosted an event to allow homeowners to drop off hazardous household materials, which keeps them from being dumped down the drain on in the yard. In addition, paper shredding was offered and the shredded paper recycled.
Taneytown Harvest Festival	October 7, 2017	◆ Multiple	Booth – materials and direct discussion w/ attendees
Hampstead Fall Fest	October 6-7, 2017	◆ Multiple	Booth – materials and direct discussion w/ attendees
Westminster FallFest	September 21-24, 2017	◆ Multiple	Booth – materials and direct discussion w/ attendees; Enviroscapes Watershed model provided for public education and demonstration
McDaniel Clean-Up Day	April 21, 2018	◆ Double Pipe Creek	Volunteers (22 students) collected 100 pounds of trash from drainage ditch along railroad track, and alleys along Pennsylvania Ave. Tree pits were cleaned
National Night Out	August 1, 2017	◆ Multiple	Booth – materials and direct discussion w/ attendees
Carroll County 4H Fair	July 29 - August 4, 2017	◆ Multiple	Booth and materials and direct discussion w/ attendees, including water quality and recycling

During 2017-18, the County's EAC partnered with the WRCC to develop a workshop designed to help equip 12 SW or SR permittees with best practices for complying with their permit requirements. Topics addressed included:

- Understanding permit requirements
- Understanding your SWPPP
- Sampling methods
- Inspections & evaluations
- Writing an annual report
- When a corrective action is needed
- Electronic reporting
- Recordkeeping
- Confirming your SIC code
- Training
- Who to contact for help
- What to do if a required element is missed
- Chesapeake Bay restoration component (for 12 SRs)
- Q&A Opportunity w/ MDE

The 12SW or SR permittees in the county were contacted and invited to attend the workshop, which was held on February 16, 2018. MDE staff participated in presenting information. The EAC will partner with the WRCC again in 2019 to develop and conduct another free workshop geared to the general public.

Media and Social Media

The County engages in regular outreach efforts through media resources, such as social media, press releases, and radio.

The County actively utilizes cable TV resources to convey public service information. This may include upcoming events, presentations, good housekeeping BMPs, and other resources. In FY 2018, LRM staff, in conjunction with Carroll's Community Media Center (CMC), produced the first in a series of videos on BMPs for homeowners entitled "Stormwater Pollution Prevention for Homeowners, Part 1 – Stormwater and Homeowners." The video introduced homeowners to stormwater and why it is important. The next video will incorporate various sources of

pollutants in residential yards and simple practices homeowners can employ to reduce runoff and prevent pollution. The video is available online and at the County's social media sites, including the County's YouTube channel (https://youtu.be/jtjcuGhihL8?list=PLwx-zJZmRR9swwLZb0WMo2r-sJDQ5lZDa.

Appointed and Staff Groups

Carroll County continues to provide an open forum on environmental issues and concerns through the EAC. This Commissioner-appointed citizen board holds monthly meetings which are open to the public. The EAC functions at the direction of the Carroll County Board of Commissioners; works cooperatively with County environmental staff to research environmental policy issues; advises the Board of County Commissioners on environmental issues; fosters environmental education; and generally acts in the best interest of County residents by promoting effective environmental protection and management principles.

In its role to promote environmental awareness and outreach, every other year the EAC accepts nominations for Environmental Awareness Awards. Winners are recognized in a joint ceremony with the Board of County Commissioners, in the press, and on the EAC's website, generally in conjunction with Earth Day and Arbor Day. The 2018 award winners were recognized in a presentation ceremony with the EAC and members of the Board of County Commissioners. Information about the award winners is available on the EAC webpage and was disseminated through a news release, social media, and newsletters (hardcopy and electronic). The award winners will also be honored at a tree planting ceremony in the fall 2018.

The EAC's Carroll County Environmental Stewardship booklet, which is updated every other year, is available on the website and is provided at various venues. The booklet describes various efforts and initiatives undertaken by the County to demonstrate environmental stewardship and protection, including stormwater mitigation and management projects and progress. The booklet was updated in 2017.

The Carroll County Solid Waste Advisory Council (SWAC) was formed in 2014 by the Board of County Commissioners. The purpose of the SWAC is to provide assistance to County staff to advance the sustainable, responsible, and cost effective practices of Solid Waste Management and Recycling in the best interests of the citizens of Carroll County and the environment. The SWAC researches and discusses issues related to solid waste and recycling and provides recommendations to the Board as requested. The SWAC meets on a regular basis and all meetings are open to the public. A member of the EAC sits on both councils and reports the status of the SWAC initiatives regularly to the other EAC members.

In addition, the Carroll County Recycling Manager sits on the Board of Directors for the Maryland Recycling Network, which provides an additional resource to the County for public education content and influence.

The WRCC was formed in 2007 through a cooperative partnership between the County, the eight municipalities, and the Carroll County Health Department by a formal joint resolution to discuss and address issues related to water resources. The WRCC discusses and collaborates on

pertinent issues related to water, wastewater, and stormwater management. The monthly meetings, which are open to the public, provide an excellent venue for members to coordinate on various current issues. The WRCC discusses NPDES technical and administrative issues on a regular basis, including monthly updates on co-permittee stormwater projects.

The WRCC serves as the local Watershed Implementation Plan (WIP) team for local implementation of Maryland's WIP and continues in this role to address WIP issues and tasks as they arise. The WRCC will continue to serve in this role as the State turns to local jurisdictions to assist with developing its Phase III WIP.

The Mount Airy Water and Sewer Commission was created to monitor all functions of the Town's water and sewer infrastructure and contribute useful research to making the system more efficient. This also includes detailed research and analysis into water and sewer operations, costs, and rates for the Town's citizens. These meetings are open to the public.

The Mount Airy Parks and Recreation Commission promotes ongoing clean-up efforts for the Rails to Trail right-of-way from the downtown area to Watkins Park, which helps to clean up the watershed.

The town/city councils and the municipal planning commissions meet regularly (**Table 8**). Discussions related to expenditure of funds and approval for stormwater projects may be discussed at these meetings, which are open to the public. The following table ("Co-Permittee Elected Officials and Planning Commissions Regular Meeting Schedule") provides the regular meeting time for each of these public bodies.

Table 8
Co-Permittee Elected Officials and Planning Commissions Regular Meeting Schedule

	Elected Body	Planning Commission
Board of County Commissioners	Every Thursday	3rd Tuesday & 1st Wednesday of month
Hampstead	2nd Tuesday of month	4th Wednesday of month
Manchester	2nd Tuesday of month	3rd Tuesday of month
Mount Airy	1st Monday of month	Last Monday of month
New Windsor	1st Wednesday of month	4th Monday of month
Sykesville	2nd & 4th Monday of month	1st Monday of month
Taneytown	2nd Monday of month	Last Monday of month
Union Bridge	4th Monday of month	3rd Thursday of month
Westminster	2nd & 4th Monday of month	2nd Thursday of month

Public Outreach Plan

The WRCC developed a Public Outreach Plan in permit year 2014-15. The primary goal of the *Carroll County and Municipalities NPDES MS4 Public Outreach Plan* is compliance with the permit. This plan provides a review of the public outreach opportunities currently available to residents and businesses in Carroll County and the municipalities regarding specific requirements of the permit and related stormwater program activities. As a result of this review,

activities were suggested to round out those opportunities and improve outreach. The intent is to raise public awareness and encourage residents and businesses to take measures to reduce and prevent stormwater pollution. This is a dynamic, iterative plan, which will be revised on a regular basis as projects are completed and other needs arise. The public outreach plan was submitted as Appendix E of the 2015 Annual Report and is available online as well. **Table 9** indicates the activities/programs under the Public Outreach Plan objectives that have been implemented thus far.

Table 9
Public Outreach Plan
Activities Implemented Under Plan Objectives

Objective	Activity/Program	Page	Implementation
Continue to deliver effective Reduce/Reuse/Recycle public outreach campaign	Take advantage of and share existing resources and initiatives available through Keep America Beautiful (KAB)	25	This is an ongoing effort.
Continue to deliver effective Reduce/Reuse/Recycle public outreach campaign	Take advantage of and share existing resources and initiatives available through Keep America Beautiful (KAB)	25	This is an ongoing effort.
Continue to provide educational materials related to litter	Develop additional materials to focus on reducing the amount of litter that reaches waterways	25	Separate materials for businesses and homeowners were developed and added to the following webpages: Business Workshop, Homeowner Workshop, Carroll Clean Water Partnership.
Create comprehensive website that is more user-friendly and accessible	Restructure website to bring NPDES under one umbrella	26	Carroll County began the process to revamp its entire website. The NPDES page will be included in this process.
Create comprehensive website that is more user-friendly and accessible	Add materials to website to address broader range of issues and needs	26	Materials directed separately to homeowners and businesses were developed and posted to the following webpages: Homeowner Workshop, Business Workshop, Carroll Clean Water Partnership. Homeowners & Stormwater video added to webpage & County YouTube.
Increase awareness of compliance hotline availability and improve access	Create a more prominent location on NPDES website for hotline	27	The hotline is easier to see on the Protecting Carroll County Waters webpage, as it is now bold and in a different color. In addition, the hotline was added to the Bureau of Resource Management website.
	Explain in more detail the purpose of the hotline	27	The webpage explains for what to call the hotline and when an emergency should warrant a call to 911.

	Add hotline # to more informational materials	27	The hotline phone number was included on the business and homeowner outreach materials developed during this permit year.
Continue to offer opportunities and materials for increased public awareness and access to permit-related, water quality information.	Conduct workshop to education general public	27	A workshop, *Homeowners & Stormwater*, was held on March 18, 2017.
Educate businesses about permit requirements, good housekeeping measures, and pollution prevention	Conduct workshop to educate businesses	28	A general workshop, *Workshop: Carroll County Businesses for Clean Water,* was held on January 5, 2016. A workshop for 12SW/SR permittees was hold on February 16, 2018, re: complying with permit requirements.
	Create a self-inspection checklist for businesses to identify additional measures they could take	28	A self-inspection checklist was created and provided to participants in the business workshop. The checklist was also posted to the following webpages: Business Workshop, Carroll Clean Water Partnership. The checklist is provided to businesses at visual inspections and during courtesy visits.
	Create slide shows & associated handouts to be part of Department speakers' bureau	28	A presentation has been drafted.
	Develop additional materials to address good housekeeping measures for businesses in the target audience	28	Materials directed to businesses were developed and posted to the following webpages: Business Workshop, Carroll Clean Water Partnership. Materials also provided on courtesy visits to businesses.
Provide opportunities for public participation during the development of watershed assessments and restoration plans	Provide notice on the County's website outlining how public may obtain information on development of watershed assessments and opportunities for comment	29	Prior to completing the assessments, notice is provided on the County's website. In addition, letters are sent to all property owners with a stream on the property to request permission to access and to invite to join. Double Pipe Creek was completed in January 2016, with letters sent October 2015. Watershed assessments and restoration plans have been completed for all watersheds.
	Provide notice in local newspaper and the County's website outlining how public may obtain information on development of restoration plans and opportunities for comment.	29	Draft restoration plans were submitted to MDE for all watersheds. The County is awaiting response from MDE before posting notice of opportunity to provide comment on the documents.
Continue to build or improve existing partnerships between the County and other entities to promote action, awareness, and recognition	County & Municipalities: WRCC	31	The WRCC continues to meet on a regular basis and looks for ways to expand collaboration and education opportunities.
	County & Municipalities: EAC	31	The EAC continues to meet on a regular basis. The number of issues and projects continues to expand, as does the EAC's public education initiatives.

	County & Municipalities: MOA	32	The County and municipalities continue to work cooperatively toward meeting their collective permit obligations.
	LRM staff & DPW staff	32	DPW staff provided the needed documentation for the Annual Report and continued to implement the Recycling program.
	Public Engagement – Volunteer Opportunities: Individuals / Groups	32	Volunteers assisted with several projects in FY17: Homeowners & Stormwater Workshop, Farm Museum Earth Day Celebration & Tree Planting, Stormwater & Homeowners video Part 1. In addition, EAC members volunteered at the Sykesville Harvest Festival, the Mount Airy Fall Fest, and the Rain Barrel & Compost Bin Day in FY17.
Explore concept of a partnership between the County and the business community to promote action, awareness, and recognition. If Carroll Clean Water Partnership (CCWP) moves forward…	Develop materials for businesses to conduct in-house, self-inspection	33	A self-inspection checklist was created and also posted to the following webpages: Business Workshop, Carroll Clean Water Partnership. It is also provided on courtesy visits to businesses.
	Partner LRM staff w/ WRCC and EAC as sponsors of CCWP, working together to comply w/ permit and provide public outreach	33	LRM staff, WRCC, and EAC continue to work together. A CCWP website was developed and is publicly available. Three workshops have been held for public outreach.
	Seek feedback at Business Community Workshop on concept	33	Participants in the 2016 Business Workshop offered feedback through an evaluation form.
	Develop educational materials focusing on good housekeeping measures for specific types of businesses in target audience	33	Materials were developed specifically for the auto-related industry as well as the food-service industry. Materials were posted to the following webpages: Business Workshop, Carroll Clean Water Partnership.
	Develop eligibility criteria for businesses to become official "Partners"	34	Criteria were developed and attached to the self-inspection checklist.
	Create certificates and window decals to present to official "Partners"	34	Window decals for designated business "Partners" were created and are available.

Community Partnership

The Carroll Clean Water Partnership (CCWP) program was initiated in January 2016, with its kickoff at the January 5, 2016, Workshop: Carroll County Businesses for Clean Water. The CCWP is a cooperative effort of LRM staff, the EAC, and the WRCC. The sponsors of the CCWP hope to foster a business-friendly environment for local businesses to identify and address potential pollutants and good housekeeping measures, and, as a result, gain community recognition for "Partners" for their contribution to achieving clean water. The program aims to assist Partners with voluntary activities related to stormwater pollution prevention. Static cling window decals are provided to Partners. A webpage was developed

(http://ccgovernment.carr.org/ccg/npdes/ccwp) and provides informational materials, the self-inspection checklist, event information, a list of Partners (as they are designated), and other relevant information.

Businesses start by assessing their current activities and identifying any specific actions needed to prevent pollution and improve water quality stewardship. For this assessment, a self-inspection checklist, titled "Completing Your Stormwater Pollution Prevention Self-Inspection Checklist and Action Plan," is available to guide business owners in identifying good housekeeping measures that could be implemented. This checklist then may also be used as an internal action plan for the business to assist in planning. A copy of the checklist is available online at http://ccgovernment.carr.org/ccg/npdes/workshop/doc/SelfInspectionChecklist.pdf?x=1496428164543. County staff is available to assist in this process if desired.

Other Outreach Activities

In Carroll County, staff is continuously involved in environmental education efforts. LRM staff regularly volunteer to speak at schools, community organizations, club meetings, and other venues in an effort to ensure that effective and timely environmental information is available to the community.

Staff partners with the CCPS Outdoor School Program each year to educate and engage sixth grade students on issues related to water quality that coincide with the curriculum. Sessions are provided on topics such as biological/stream health, stormwater, and the importance and benefits of tree planting.

Carroll County Department of Recreation and Parks launched a campaign to encourage additional community involvement to help keep County parks clean. The Helping Hands Keep Parks Green initiative is modeled after similar efforts, such as Adopt-A-Road, and is designed to invest community members in the care of parks. While volunteer recreation councils already perform countless hours of maintenance related to athletic fields, the Helping Hands campaign is focused more on general park cleanliness, trash pickup, and trail maintenance. It focuses on soliciting volunteers from organizations such as service clubs, scout troops, churches, homeowner associations, and local businesses.

E. Restoration Plans and Total Maximum Daily Loads

1. Watershed Assessments

Watershed Assessments have been completed for each of the 9 watersheds within Carroll County. Each assessment is completed on the 8-digit level, and further divided down to the 12-digit level for a subwatershed analysis. Each watershed assessment consists of a stream corridor assessment (SCA) and a characterization plan.

The County conducted SCAs in accordance with the Stream Corridor Assessment Survey Protocols, developed in 2001 by the Maryland Department of Natural Resources (DNR),

Watershed Restoration Division. Assessments were performed between January and March by County staff through cooperation of private landowners and municipalities. Landowner permission for access to stream corridors is obtained through a mailing detailing the purpose and timing of the assessment with a return response postcard. The County received permission to assess 786 miles of the 1,464 miles, or approximately 54 percent, of the stream miles within the County **(Table 10**).

During each SCA, field teams collect information relating to eroded streambanks, channel alterations, exposed utility pipes, drainage pipe outfalls, fish barriers (debris jams), inadequate streamside buffers, trash dumps, and construction activity that are either in or near the stream. Any unusual conditions are also noted. Each impairment is then ranked on a scale of 1 to 5 in relation to the impairment's severity, accessibility, and correctability. The goal of the numeric ranking is to identify and rank current impairments within the watershed to assist in prioritizing locations for restoration implementation.

In addition to the on-the-ground field assessments, County staff have also conducted a desktop analysis of each of the nine 8-digit watersheds in a characterization plan. Each watershed's characterization plan describes the unique background of the watershed including the natural and human characteristics of the watershed and any water quality and living resource data that has been collected within the watershed. The characterization plans are intended to provide a background on the hydrological, biological, and other natural characteristics of the watershed as well as discuss human characteristics that may have an impact within the watershed.

Table 10
Watershed Assessment Status

8-Digit Watershed	Major Basin	Miles Assessed	Total Miles	% Assessed	Year Assessed
Watersheds Assessed					
Prettyboy	Gunpowder	80	97	82%	2011
Liberty	Patapsco	255	458	56%	2012
South Branch Patapsco	Patapsco	156	218	72%	2013
Lower N. Branch Patapsco	Patapsco	6	6	100%	2014
Lower Monocacy	Monocacy/ Potomac	10	23	43%	2014
Conewago Creek	Susquehanna	11	18	61%	2014
Upper Monocacy	Monocacy/ Potomac	71	128	55%	2015
Double Pipe	Monocacy/ Potomac	266	514	52%	2016
Loch Raven	Gunpowder	2	3	66%	2016
	Total:	***786***	***1,464***	**54%**	

2. Restoration Plans

Six of the nine 8-digit watersheds in Carroll County have an associated TMDL WLA for developed source types. Each restoration plan focuses on impacts documented during the Stream Corridor Assessment (SCA) for each watershed, and prioritizes projects at the 12-digit scale based on assessment findings. Restoration plans for these 6 watersheds were sent to MDE in August, 2016 for review. The six watersheds included; Prettyboy, Liberty, Loch Raven, Lower Monocacy, Upper Monocacy, and Double Pipe Creek. In addition to the restoration plans, this submission included SCA's and Watershed Characterizations for each watershed.

In September 2017 the County received written comments from MDE's Sediment, Stormwater, and Dam Safety Program, and Water and Science Administration relating to TMDL implementation plans (restoration plans). The County addressed various points and deficiencies provided by MDE, and re-submitted the six restoration plans in December of 2017. The County has not received correspondence from MDE regarding the December, 2017 submission. The County anticipates continuing to work closely with the Center for Watershed Protection to address any further comments provided by MDE; however, would appreciate MDE's consideration on establishing fiscally sound approaches to requirements associated with the restoration plans.

Carroll County continues implementing an aggressive program related to watershed restoration projects. The County's actual completed restoration as of June 30, 2018 was 1,634.8 impervious acres treated and 2,309 acres of drainage area treated (green in **Table 11**). The projects listed in blue in **Table 11** indicate the restoration efforts which addressed the initial 10 percent requirement in the 3rd generation permit. The percentage of treatment as of June 2018 was 101 percent of the 1,614 acres required to be treated under this permit.

Table 11 provides a complete accounting of impervious area treated or planned to be treated. As indicated in **Table 11**, there are projects under construction or in design scheduled for completion in 2019 and 2020 which will treat an additional 798.41 acres (orange in **Table 11**) bringing the anticipated County total for this permit of treated impervious acres to 2,433.21. The County anticipates approximately 33 acres of forested and grassed buffer credits through our development process over the next 2 fiscal years, making the total of impervious acres treated 2,466 which is 152.8% of the 20% permit requirement of 1,614 acres.

Figures 5 and **6** depict a graphic representation of acres restored (green), acres in the design phase (orange), and acres in the planning phase (red) for projects to restore impervious surfaces and associated drainage areas to the mitigation project. These graphs provide an excellent representation related to the level of true watershed restoration accomplished via the County's restoration efforts.

Table 11
Listing of Watershed Restoration Efforts, July 2018
NPDES

Carroll County First Permit Requirements					
Year	Project Name	Project Type	Project Status	Impervious Area Credit	MDE Watershed
1997	Longwell County Park	600 LF Stream Restoration	Completed	142.80	Liberty Reservoir
1998	Carroll County Times	200 LF Stream Restoration	Completed	0.50	Liberty Reservoir
1999	Piney Run	936 LF Stream Restoration	Completed	258.07	Loch Raven Reservoir
1993-2005	Forest Buffer Easements	Forest Buffer	Completed	147.47	
1993-2005	Grass Buffer Easements	Grass Buffer	Completed	139.43	
	Completes 1st permit term requirement of 10% treatment			**688.27**	

Listing of Watershed Restoration Efforts July 2018 NPDES					
Year	Project Name	Project Type	Project Status	Impervious Area Credit	MDE Watershed
2005	Eldersburg Elementary School	Retrofit	Completed	1.40	Liberty Reservoir
2006	Chung	Outfall Restoration	Completed	10.00	S Branch Patapsco River
2007	Marriott Wood I Facility #1	Retrofit	Completed	0.60	Liberty Reservoir
2007	Winfield Fire Department Addition	New Construction	Completed	0.20	S Branch Patapsco River
2009	Bateman SWM Pond	New Construction	Completed	6.20	Liberty Reservoir
2009	Collins Estate	Retrofit	Completed	3.90	Liberty Reservoir
2009	Hickory Ridge	Retrofit	Completed	6.60	Liberty Reservoir
2009	Marriott Wood I Facility #2	Retrofit	Completed	2.80	Liberty Reservoir
2009	Marriott Wood II	Retrofit	Completed	1.90	Liberty Reservoir
2009	South Carroll High School	New Construction	Completed	12.90	S Branch Patapsco River
2009	Westminster Airport Pond	Retrofit	Completed	93.50	Liberty Reservoir
2010	Brimfield	Retrofit	Completed	12.60	S Branch Patapsco River

Year	Project Name	Project Type	Project Status	Impervious Area Credit	MDE Watershed
2010	Elderwood Village	Retrofit	Completed	3.40	Liberty Reservoir
2010	High Point	Retrofit	Completed	0.90	Liberty Reservoir
2010	Oklahoma II Foothills	Retrofit	Completed	8.10	Liberty Reservoir
2010	Upper Patapsco Phase I - Naganna Pond	New Construction	Completed	13.90	Liberty Reservoir
2010	Upper Patapsco Phase II - Hoff Pond	New Construction	Completed	4.10	Liberty Reservoir
2011	Arthur Ridge	Retrofit	Completed	6.60	S Branch Patapsco River
2011	Edgewood	Retrofit	Completed	16.70	Liberty Reservoir
2011	Heritage Heights	Retrofit	Completed	4.10	Liberty Reservoir
2011	Oklahoma Phase I	Retrofit	Completed	10.00	Liberty Reservoir
2011	Quail Meadows	Retrofit	Completed	23.25	Liberty Reservoir
2012	Hampstead Impervious Area Removal	Impervious Removal	Completed	0.13	Prettyboy Reservoir
2012	Clipper Hills - Gardenia	Retrofit	Completed	15.24	S Branch Patapsco River
2012	Clipper Hills - Hilltop	Retrofit	Completed	25.49	S Branch Patapsco River
2012	Harvest Farms 1A	Retrofit	Completed	11.25	S Branch Patapsco River
2012	Parrish Park	Retrofit	Completed	18.20	S Branch Patapsco River
2012	Sunnyside Farms	New Construction	Completed	3.30	Double Pipe Creek
2012	Wilda Drive	New Construction	Completed	1.63	Liberty Reservoir
2013	Westminster Community Pond	New Construction	Completed	87.85	Liberty Reservoir
2013	Westminster High School	New Construction	Completed	44.81	Liberty Reservoir
2013	Tree plantings	Tree plantings	Completed	7.13	
2014	Benjamin's Claim	Retrofit	Completed	20.55	S Branch Patapsco River
2014	Carrolltowne 2A Gemini Drive	Retrofit	Completed	47.26	S Branch Patapsco River
2014	Carrolltowne 2B	Retrofit	Completed	14.27	S Branch Patapsco River
2014	Diamond Hills Section 5	Retrofit	Completed	16.27	Liberty Reservoir
2014	Friendship Overlook/Diamond Hills Section 2	Retrofit	Completed	18.58	Double Pipe Creek
2014	Tree plantings	Tree plantings	Completed	9.64	

Year	Project Name	Project Type	Project Status	Impervious Area Credit	MDE Watershed
2015	Benjamin's Claim Basin B	Retrofit	Completed	0.56	S Branch Patapsco River
2015	Braddock Manor West	Retrofit	Completed	10.52	S Branch Patapsco River
2015	Eldersburg Estates 3-5	Retrofit	Completed	11.22	S Branch Patapsco River
2015	Tree plantings	Tree plantings	Completed	20.25	
2016	Tree plantings	Tree plantings	Completed	11.97	
2017	Carroll County Maintenance Center	Retrofit	Completed	34.44	Double Pipe Creek
2017	Farm Museum - Bioretention A	New Construction	Completed	0.50	Double Pipe Creek
2017	Farm Museum - Bioretention B	New Construction	Completed	2.55	Double Pipe Creek
2017	Farm Museum - Drywell	New Construction	Completed	0.03	Double Pipe Creek
2017	Farm Museum - Landscape Infiltration	New Construction	Completed	0.06	Double Pipe Creek
2017	Farm Museum - Rain Barrel	New Construction	Completed	0.01	Double Pipe Creek
2017	Farm Museum - Rain Garden	New Construction	Completed	0.05	Double Pipe Creek
2017	Finksburg Industrial Park	Retrofit	Completed	22.34	Liberty Reservoir
2017	Jenna Estates	Outfall Restoration	Completed	0.50	S Branch Patapsco River
2017	Miller/Watts	Retrofit	Completed	35.24	Liberty Reservoir
2018	Eldersburg Business	Retrofit	Completed	70.36	Liberty Reservoir
2018	Small Crossing Sand Filter	Retrofit	Completed	11.02	Prettyboy Reservoir
2018	Small Crossings Bioretention	New Construction	Completed	0.53	Prettyboy Reservoir
2018	Blue Ridge Manor	Retrofit	Completed	11.25	Double Pipe Creek
2018	Central Maryland (Wet Facility)	Retrofit	Completed	35.51	Liberty Reservoir
2018	Hawks Ridge	Retrofit	Completed	25.10	S Branch Patapsco River
2018	Randomhouse	Retrofit	Completed	22.52	Liberty Reservoir
2018	Feeser Property	New Construction	Completed	1.72	Liberty Reservoir
2018	Exceptional Center	Retrofit	Completed	16.57	Double Pipe Creek
2006-2018	Forest Buffer Easements	Forest Buffer	Completed	203.96	
2006-2018	Grass Buffer Easements	Grass Buffer	Completed	165.34	
2018	Inlet Cleaning (updated yearly)	Inlet Cleaning	Completed	13.56	
2018	Septic Upgrades (to date)	Retrofit	Completed	48.62	

Year	Project Name	Project Type	Project Status	Impervious Area Credit	MDE Watershed
2018	Septic Pumping (updated yearly)	Septic Pumping	Completed	260.13	
2018	Street Sweeping (updated yearly)	Street Sweeping	Completed	5.99	
2018	Tree plantings	Tree plantings	Completed	7.13	
	Completed toward 20% goal			**1634.80**	

Carroll County Projects in Design or Under Construction for Current Permit Requirements					
Year	Project Name	Project Type	Project Status	Impervious Area Credit	MDE Watershed
2019	Elderwood Village Parcel B/Oklahoma 4	Retrofit	Design	90.53	Liberty Reservoir
2019	Langdon (Jantz)	New Construction	Design	92.10	Double Pipe Creek
2019	Locust wetland	New Construction	Design	11.00	Double Pipe Creek
2019	Merridale Gardens	Retrofit	Under Construction	25.13	S Branch Patapsco River
2019	Roberts Mill	Retrofit	Design	87.00	Upper Monocacy River
2019	Shannon Run	Retrofit	Design	46.89	S Branch Patapsco River
2019	Shiloh Middle	Retrofit	Design	23.05	Liberty Reservoir
2019	Tree Plantings	Tree Plantings	Design	5.30	
2019	Whispering Valley Phase 4	Retrofit	Design	25.50	Prettyboy Reservoir
2020	Cascade Lake	New Construction	Concept	85.00	Liberty Reservoir
2020	Central Maryland (Dry Facility)	Retrofit	Design	61.88	Liberty Reservoir
2020	Greens of Westminster Sec 2 #6	Retrofit	Design	21.45	Double Pipe Creek
2020	Hampstead Regional Facility	Retrofit	Concept	116.88	Liberty Reservoir
2020	Tree Plantings	Tree Plantings	Design	6.70	
2020	Willow Pond	Retrofit	Design	100.00	Liberty Reservoir
	Anticipated toward 20% goal			**798.41**	

Carroll County Projects in Planning					
Year	Project Name	Project Type	Project Status	Impervious Area Credit	MDE Watershed
2021	Brynwood	New Construction	Concept	29.84	Liberty Reservoir
2021	Candice Estates	New Construction	Concept	17.88	Lower Monocacy River
2021	Elmer Wolfe	Retrofit	Design	4.79	Double Pipe Creek
2021	Manchester Elementary	New Construction	Concept	4.94	Prettyboy Reservoir

Year	Project Name	Project Type	Project Status	Impervious Area Credit	MDE Watershed
2021	Melstone Valley	Retrofit	Concept	22.50	S Branch Patapsco River
2021	Valley Vista	New Construction	Concept	6.50	Prettyboy Reservoir
2021	Woodsyde Estates Large Facility	Retrofit	Design	14.72	S Branch Patapsco River
2021	Woodsyde Estates Small Facility	Retrofit	Design	0.90	S Branch Patapsco River
2022	IDA Property (Mt. Airy)	New Construction	Concept	14.44	S Branch Patapsco River
2022	Piney Ridge Village As-built 57	Retrofit	Concept	11.00	S Branch Patapsco River
2022	Squires	Retrofit	Concept	13.75	Liberty Reservoir
2022	Trevanion Terrace	Retrofit	Design	52.00	Upper Monocacy River
2022	Winters Street	Retrofit	Concept	36.01	Liberty Reservoir
2023	Wind Song Est.	New Construction	Concept	11.76	Lower Monocacy River
2023	New Windsor Railroad	New Construction	Concept	15.34	Double Pipe Creek
2023	Manchester East	New Construction	Concept	36.60	Prettyboy Reservoir
2023	Carroll Co Health Department	New Construction	Concept	6.72	Double Pipe Creek
2023	Meadowbrook	Retrofit	Concept	8.70	Upper Monocacy River
	Anticipated impervious treatment			**308.39**	

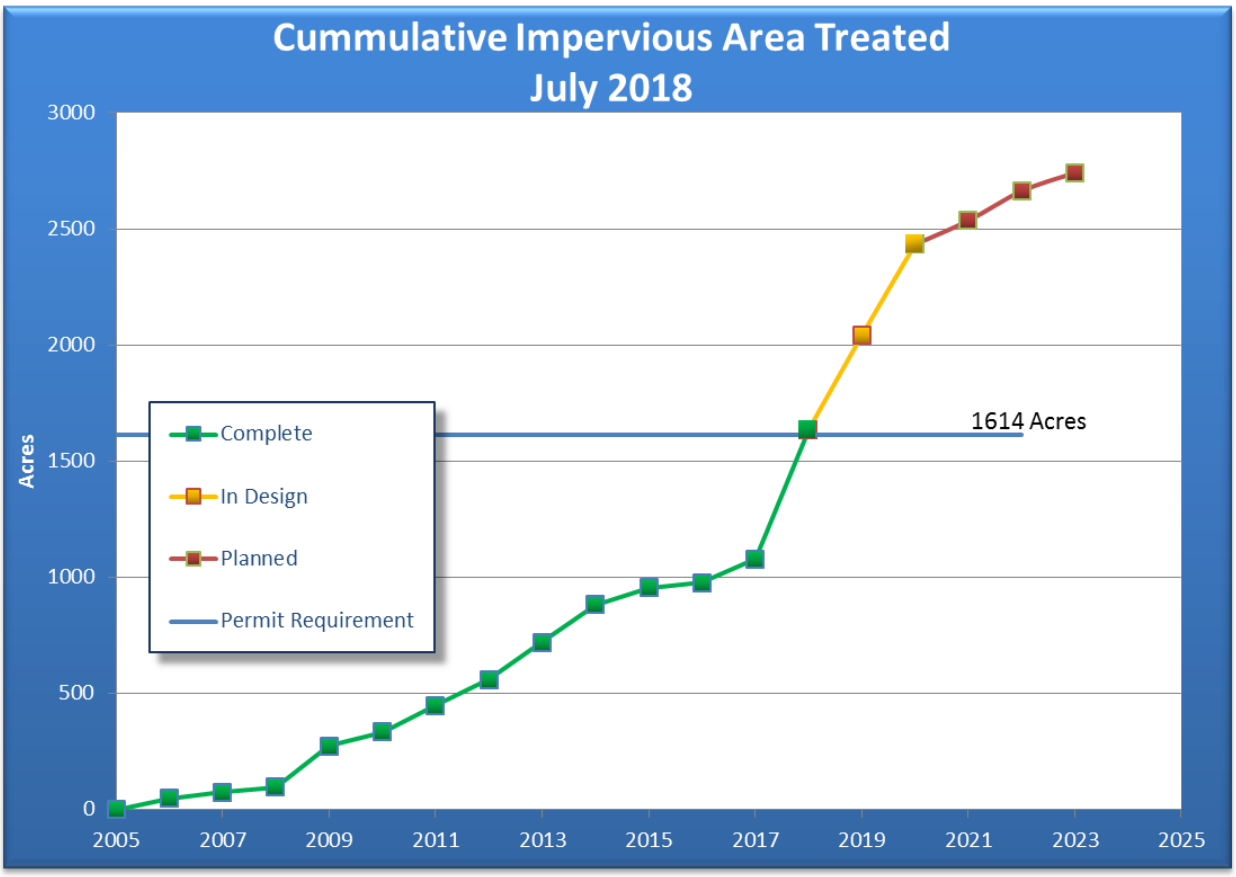


Figure 5: Impervious Surface Acres Treated: Constructed, Under Design, and Planned Projects

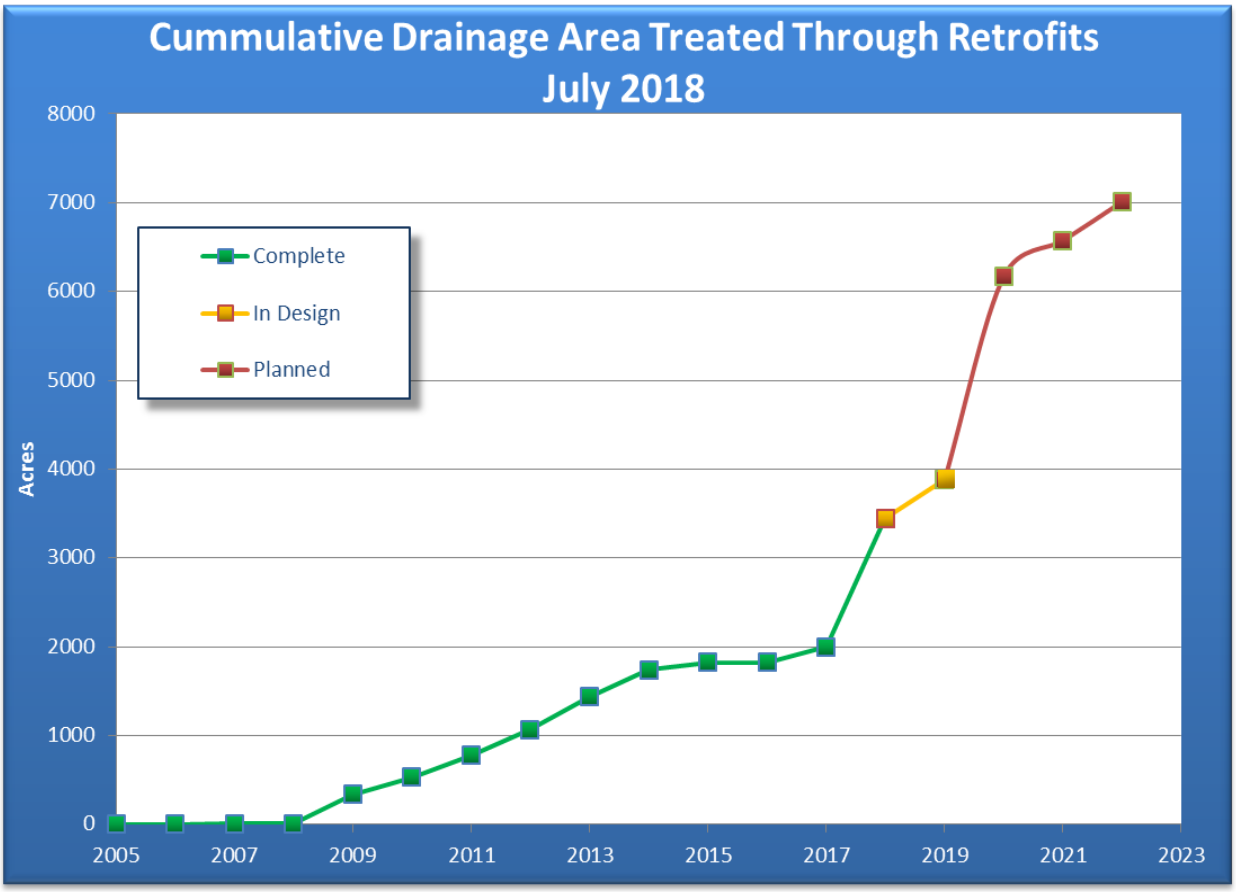


Figure 6: Drainage Area Acres Treated: Constructed, Under Design, and Planned Projects

3. Public Participation

As part of the watershed restoration efforts, staff reaches out to the public to share best management practices designed to equip homeowners with good housekeeping practices they can use in their homes and in their yards.

- At a workshop held at Carroll Community College on March 18, 2017, homeowners were offered information focusing on composting, rain gardens, lawn care and landscape management, septic maintenance, recycling, permeable pavement, stream buffers and tree planting, and general homeowner BMPs.
- A video introducing homeowners to stormwater was produced and is available online.
- Staff has produced several publications, which are available for use at events and for viewing or downloading online.
- Another homeowner workshop is planned for 2019.

4. TMDL Compliance

Carroll County continues to aggressively and consistently pursue measures to improve water quality and work towards meeting applicable stormwater WLAs. The County fully supports achieving pollutant load reductions through strong fiscal commitments, staff resources to implement the stormwater program, and coordination between co-permittees. The County's fiscal expenditures and capital budgeting – historical, current, and planned – demonstrate the implementation of this commitment. The County completed the impervious mitigation goal of the third generation permit and has achieved the fourth generation permit's impervious area restoration requirement as well. This progress demonstrates the County's aggressive implementation toward meeting these goals.

In addition to 101 percent of the untreated impervious area restored to date, the County tracks and documents pollution load reductions from all completed structural and nonstructural water quality improvement projects, enhanced stormwater management programs, and alternative stormwater control initiatives. **Table 2** provided a detailed list of completed projects and associated pollutant load reductions demonstrating progress toward the TMDL WLAs. **Appendix F** consists of tables summarizing the net change in pollutant load reductions from all completed structural and nonstructural water quality improvement projects and alternative stormwater measures and how work associated with restoration efforts translates into requirements associated with meeting local WLA and actual Chesapeake Bay TMDL reductions. Edge of stream load reductions (EOS) and associated reduction to loads delivered to the Chesapeake Bay by segment shed is also included in **Appendix F**. Annual TMDL assessments to evaluate the effectiveness of the County's restoration plans and how these plans are working toward achieving compliance with EPA-approved TMDLs will be reported following approval of the restoration plans for the individual watersheds. Attachment B of the County's permit lists the EPA-approved TMDLs for Carroll County.

In addition to nutrient and sediment TMDLs, Attachment B of the County's permit includes TMDLs for mercury. Based on MDE's *Guidance for Developing a Stormwater Wasteload*

Allocation Implementation Plan for Mercury Total Maximum Daily Loads (May 2014), atmospheric deposition is the major loading source to mercury-impaired waters in Maryland, primarily originating from power plants. While urban stormwater conveyance systems transport the atmospherically deposited mercury downstream, the impervious surfaces and conveyance systems are not the source. Due to this source of anthropogenic mercury, the guidance document indicates that the majority of TMDL- and WLA-required mercury load reductions are expected to occur at the state and federal level.

The list of EPA-approved TMDLs for Carroll County, found in Attachment B of the permit, also includes bacteria. MDE's *Guidance for Developing a Stormwater Wasteload Allocation Implementation Plan for Bacteria Total Maximum Daily Loads* (May 2014) does not provide quantifiable methodology for tracking and measuring bacteria pollutant load reductions. However, in Carroll County, both bacteria and mercury load reductions will primarily be addressed through the measures and BMPs implemented to address nutrient and sediment TMDLs in the County. Carroll County's primary approach to stormwater retrofits is the use of enhanced infiltration and filtration. This strategy optimizes removal of mercury and bacteria. Therefore, while not strictly quantifiable, this approach provides enhanced removal of these constituents to the maximum extent practicable.

More specific details for non-nutrient and non-sediment TMDLs are included in the restoration plans for each individual relevant watershed currently being revised by the County after receiving comments from MDE.

The County fully supports its stormwater program through strong fiscal commitments, staffing resources to implement the program, and coordination between co-permittees. The County's fiscal expenditures and capital budgeting – historically, currently, and planned – demonstrate the implementation of this commitment. The permittees further demonstrate the commitment to achieve the impervious restoration requirement and other provisions and requirements contained in the permit through the MOA signed by all co-permittees. This MOA obligates funding for the capital costs to meet the permit's impervious restoration requirements associated with the municipalities, as well as overall administrative support by the County.

Carroll County's annual operating expenditures for this program have more than tripled since 2008, from approximately $334,000 annually, to more than $2.2 million annually. These expenses cover salaries and benefits of employees, monitoring supplies, educational material, monitoring analysis, training information, consultant fees, stormwater management facility maintenance, contractor costs, equipment needs, and bond interest and principle.

Additionally, $22.8 million has been reserved for 24 watershed restoration efforts in the Community Investment Program (CIP) for FY 2019 to FY 2024. Costs associated with restoration efforts have been offset through the success of the County's grants program. Since 2008, more than $13.5 million of grant funding has been awarded to Carroll County.

F. Assessment of Controls

1. Introduction

Purpose

Carroll County is required to conduct a discharge characterization as part of its NPDES permit conditions for the purpose of evaluating the efficacy of stormwater management. This component consists of monitoring the discharge from a stormwater management facility as well as assessing impacts to the receiving water body as described below. The state of Maryland has developed a database of discharge data collected by several permit holders in order to characterize stormwater runoff associated with various stormwater management efforts.

The discharge characterization is implemented through the Assessment of Controls (Part IV.F.) of the permit, which delineates specific data collection and analysis efforts to be undertaken. Carroll County has been collecting data in support of this program component since August 2000 downstream of the stormwater management facility associated with the Air Business Center just north of Westminster. This stormwater management facility was originally constructed as a wet pond in 1979 and was retrofitted as a wet pond with forebay to provide water quality, recharge volume, and channel volume protection in 2008.

Study Area and Requirements

The discharge characterization is completed in a first order stream that is a tributary to the West Branch of the North Branch Patapsco River. The location of the watershed where monitoring is conducted within the County is shown in **Figure 7**, while the location of the monitoring stations and other watershed features are shown in **Figure 8** The study area is located near the topographic divide separating the eastern and western piedmont physiographic provinces. As shown in **Figure 7**, the unnamed tributary drains the upper-most extent of first order tributary and is located in the Liberty Reservoir watershed.

The Air Business Center regional stormwater management facility discharges via a constructed outfall to a small stream that travels southeast to the confluence with the West Branch. The stream receives the majority of water from the pond, with contribution from overland flow from the drainage basin during precipitation events. A new stormwater management pond at the West Branch Trade Center has been constructed adjacent to and east of the Air Business Center stormwater management facility. This facility drains to the stream, just downstream of the outfall station.

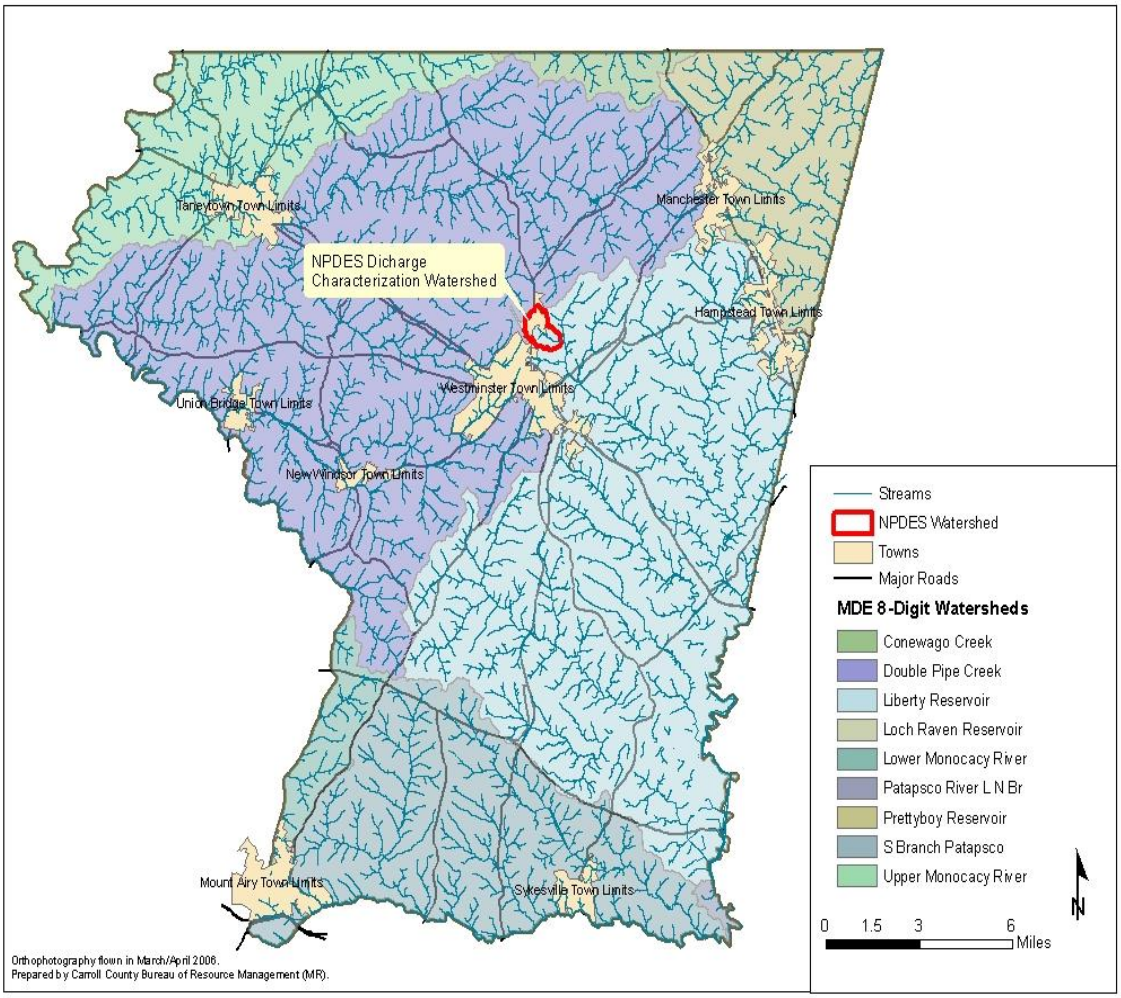


Figure 7: Carroll County NPDES Discharge Characterization Location

Program Elements

The discharge characterization consists of three primary data collection efforts to assess the effectiveness of the stormwater controls on stream health: physical monitoring, chemical monitoring, and biological monitoring. These data are collected at the two monitoring stations shown in **Figure 8** where the cumulative effects of watershed restoration efforts can best be assessed.

Physical monitoring is conducted in the spring of each reporting year and consists of the following elements:

- Geomorphic stream assessment to include an annual comparison of permanently monumented stream channel cross-sections and a stream profile to evaluate channel stability; and
- A stream habitat assessment for assessing areas of aggradation and degradation; and
- Analysis of the effects of rainfall discharge rates, stage, and continuous flow on geometry (if needed).

Chemical monitoring is completed throughout the reporting year and requirements consist of the following elements:

- Samples of eight storm events at each monitoring location, with at least two occurring each calendar year quarter. During extended dry periods, base-flow samples are collected one time per month.
- Sampling is completed with automated equipment to include pH and temperature, and each storm limb is characterized.
- Laboratory analysis is completed for a number of chemical constituents and Event Mean Concentrations (EMCs) calculated and reported.

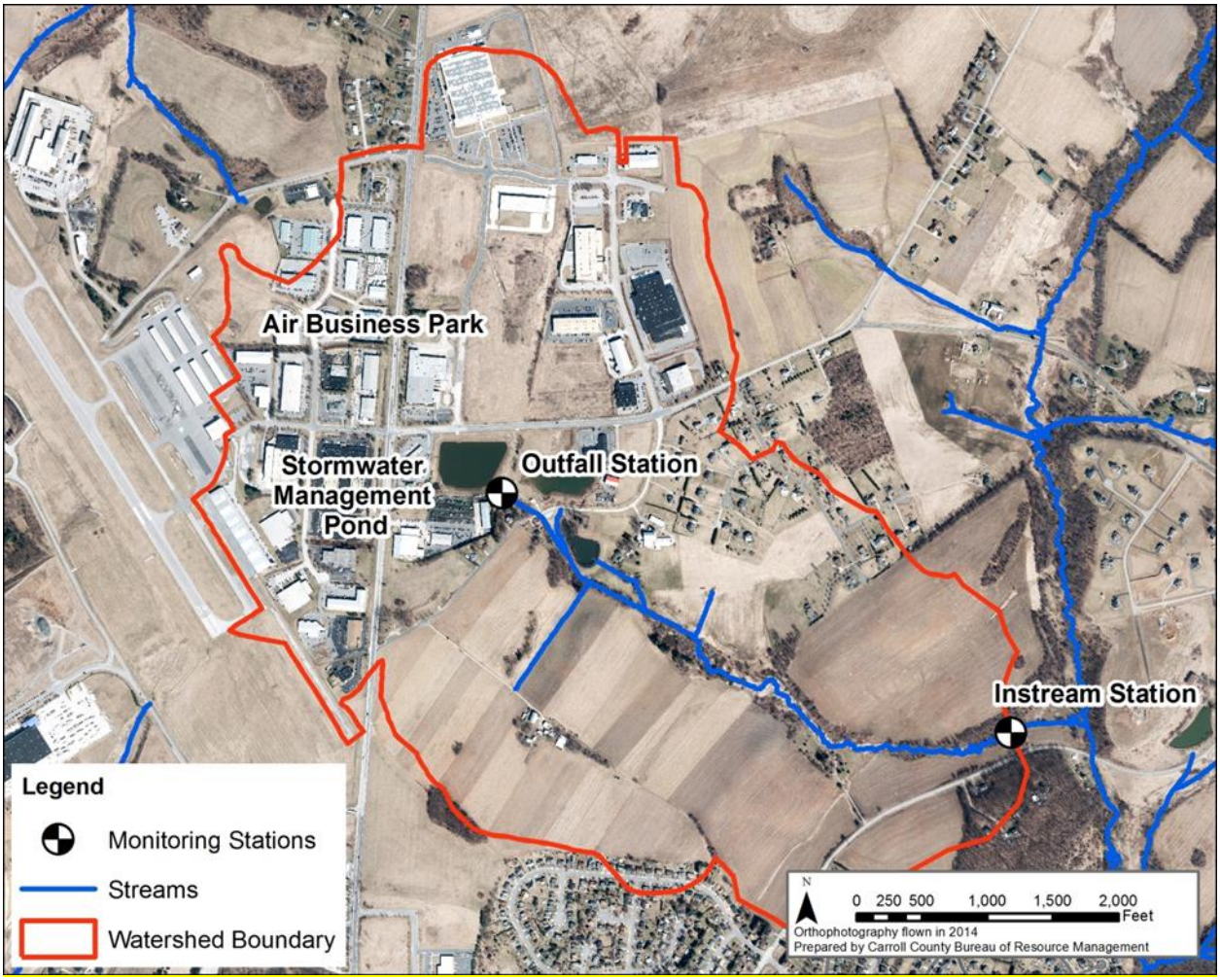


Figure 8: NPDES Discharge Characterization Watershed

Biological monitoring is completed in the spring of the reporting year and consists of the following elements:

- Assessment of benthic macro-invertebrates at both monitoring stations to assess stream health; and
- Completion of a spring habitat assessment.

2. Data Collection and Analysis Methods

Climatological

The climate of Carroll County is characterized as temperate and moderately humid (Meyer and Beall, 1958). The 30 year average County temperature is 54° Fahrenheit (F) with monthly means ranging from 32°F in January to 76°F in July (NOAA, 2014). The 30 year average County precipitation is 43.4 inches with monthly means ranging from 2.5 inches in February to 4.3 inches in July (NOAA, 2014). Temperature data were collected from the weather station at the Carroll County Regional Airport as in the previous reporting years. This station is operated by the Carroll County Government in accordance with National Weather Service Standards. Precipitation data, previously collected at the Carroll County Regional Airport, were collected for this reporting period at the Westminster Waste Water Treatment Plant.

Hydrological

To understand the hydrology in the study watershed, continuous stream discharge data is necessary. Therefore, both monitoring stations are equipped with instrumentation to collect this continuous data. The outfall station has dedicated electric power and is equipped with an ISCO model 4250 flow meter and a model 3700 portable sampler. The instream station is also equipped with dedicated ISCO flow measuring and sampling equipment and is powered by a deep cycle, 12 volt marine battery. An ISCO model 6712 portable sampler and model 4230 bubbler-type flow meter are deployed at this station.

Hydrology data collection at the instream station consists of a stilling well, staff plate, and bubbler assembly which is part of the ISCO flow meter. The instrument converts the hydrostatic pressure required to maintain the bubble rate. This pressure is proportional to the stream stage. County staff regularly collects stage-discharge data to relate stage to discharge. The hydrology data collection at the outfall station consists of a dedicated stage/velocity meter anchored to the outfall pipe. The logging device uses Manning's equation and input from the sensor to convert stage to discharge. The pipe discharge stage is regularly checked to verify the instrumentation is functioning properly.

Flowlink Version 5.1 software by ISCO is used to complete hydrologic data analysis. Data collected at the monitoring stations are downloaded to a laptop computer via serial communication. New hydrologic data is appended to the existing data record for each station. The stream characterization data is exported from Flowlink to excel for most analyses.

Due to equipment malfunctions, stage-discharge measurements for one or both stations were unavailable at various times. Discharge was estimated during these times from several

relationship models using the other station as a reference when available. Analogous storm events from periods with complete data were extracted to create relationship models with those storm events that occurred during periods with missing discharge measurements. Relationship models were created for each limb of the analogous storm events and were then used to estimate stage-discharge of the paired storm event using the other station as the reference.

Geomorphological

During the spring of 2018, Carroll County conducted a geomorphologic assessment for the entire stream reach, from the outfall of the Air Business Park stormwater management facility, to the confluence with the West Branch of the Patapsco River. As required, survey points were again collected at the six permanent, monumented cross-sections determined to be representative of each stream reach. At each of these monumented cross-sections, the County survey department collected data for bank slope, toe, stream edges, channel bottoms, and tops.

The County survey crew continues to collect data at each of the 28 segments (approximately 200 foot intervals) along the same stream reach. The data collected for this effort are similar to the data collected at the six monumented cross-sections, describing the stream channel cross-section. The survey crew collected data for the stream channel bottom at the thalweg, the edge of water at each bank, and the top of each stream bank.

A Level 1 geomorphologic stream assessment has been conducted on the entire stream reach to assess potential geomorphologic changes to the stream. This assessment consisted of two major components: an assessment of stream channel changes and an interpretation of these changes.

The assessment of stream channel changes involves determining channel segment characteristics and assessing dimensional changes. The assessment evaluations include an interpretation of changes in channel response, manifested through a comparative evaluation of channel geometry changes, including cross-sectional dimensions, in the context of the physical setting.

Chemical

Carroll County staff collects all storm and baseflow chemical samples while continuing to contract with Martel Laboratories, Inc., in Baltimore, MD to conduct all of the lab analyses. The sampling program consists of a first flush component for total petroleum hydrocarbons, bacteriological constituents, and physical parameters as well as chemical parameters collected during each of the three storm limbs. **Table 12** includes the required parameters for laboratory analysis, the laboratory method, and the corresponding method reporting limit.

Table 12
Laboratory Methods and Detection Limits for Parameters Tested

Parameter Tested	Method	Reporting Limit
First Flush Sample		
pH	EPA 150.1	-
Temperature	EPA 170.1	-
Specific Conductance	SM 2510 B-97	1.0 µmhos/cm
Total Petroleum Hydrocarbons	EPA 1664	5.0 mg/L
Escherichia Coli	SM 9223 B-94	1.0 organisms/ 100mL
Limb Samples		
Nitrate/Nitrite Nitrogen	SM 4500NO3-H00	0.05 mg/L
Biological Oxygen Demand	SM 5210 B-01	2.0 mg/L
Total Copper	EPA 200.8	2.0 µg/L
Total Lead	EPA 200.8	2.0 µg/L
Total Zinc	EPA 200.8	20.0 µg/L
Total Kjeldahl Nitrogen	SM 4500NH3 C-97	0.5 mg/L
Total Phosphorus	SM 4500P-P E-99	0.01 mg/L
Total Suspended Solids	SM 2540 D-97	1.0 mg/L

The County continues to use the same type of storm event monitoring equipment manufactured by ISCO, Inc. to comply with this component of the County's NPDES permit. The instream station is equipped with an ISCO Model 6712 auto sampler, whereas the outfall station has an ISCO Model 3700 auto sampler. The outfall sampler is paced with an ISCO Model 4250 level flow meter, while the instream sampler is paced using an ISCO Model 4230 bubbler flow meter. This reporting year was the second that all chemical sampling was collected by Carroll County staff. Personnel from Martel had previously collected some or all chemical samples. The flow monitoring and event mean concentration (EMC) calculation methods are the same as those used in previous reporting years. Martel Labs continues to send results via e-mail to the County where the new records are appended to the existing MS Access database and NPDES geodatabase.

The event dates for this reporting year are shown in **Table 13.** Please note that 20 total sampling events are reported; 8 of the total events were storm events.

Table 13
2017 – 2018 NPDES Discharge Characterization Sampling Events

Event	Date	Event Type	Instream Physical Water Data			Outfall Physical Water Data		
			pH	Water Temp (F)	Conductivity (µmhos/cm)	pH	Water Temp (F)	Conductivity (µmhos/cm)
2017-09	7/6/2017	Storm	7.1	66	360	7.84	79	320
2017-10	7/20/2017	Base Flow	7.17	67	390	7.59	79	290
2017-11	7/28/2017	Storm	7.33	68	280	7.48	76	300
2017-12	8/17/2017	Base Flow	7.43	66	300	8.59	76	230
2017-13	9/19/2017	Base Flow	8.16	62	370	8.92	70	250
2017-14	10/9/2017	Storm	8.1	69	320	8.14	71	380
2017-15	10/19/2017	Base Flow	8.33	50	360	8.67	59	300
2017-16	10/29/2017	Storm	8.25	56	240	8.52	57	230
2017-17	11/16/2017	Base Flow	8.26	48	290	8.65	45	240
2017-18	12/19/2017	Base Flow	8.93	44	340	8.85	41	420
2018-01	1/23/2018	Storm	7.12	42	450	7.35	43	1300
2018-02	1/25/2018	Base Flow	7.28	37	720	7.62	38	1300
2018-03	2/15/2018	Base Flow	8.09	45	970	8.74	41	2500
2018-04	3/15/2018	Base Flow	8.34	40	430	9.31	36	1300
2018-05	3/21/2018	Storm	7.57	39	548	8.66	39	1231
2018-06	4/16/2018	Storm	7.83	51	460	8.43	52	1400
2018-07	4/24/2018	Base Flow	7.72	51	460	8.9	57	1100
2018-08	4/25/2018	Storm	7.79	53	410	8.21	57	980
2018-09	5/10/2018	Base Flow	8.35	58	430	8.76	68	980
2018-10	6/19/2018	Base Flow	7.1	66	370	8.14	77	380

Biological

Two monitoring sites corresponding to the Outfall and Instream stations have been characterized since the 2000 reporting period. The 75-meter sampling sites, shown in **Figure 9** were not randomly selected. Results from the data gathered over the years may reflect changes in stream conditions downstream of the regional stormwater management facility.

Data collection, macro-invertebrate identification, and analytical methods were in accordance with the Maryland Biological Stream Survey (MBSS) guidance manuals (Sampling Manual Field Protocols, 2014 (http://www.dnr.state.md.us/streams/pdfs/R4Manual.pdf). The County continues to contract with DNR to identify and enumerate all benthic macro invertebrate samples. The samples were processed and identified by Ellen Friedman, MD DNR principal

taxonomist with over 20 years of identification experience. An index of Biotic Integrity (IBI) score was calculated using the criteria located in **Table 14.** These six criteria are rated a one, three, or five depending on the species present. The average of all criteria is considered the overall IBI score. Narrative ratings can be found in **Table 15.**

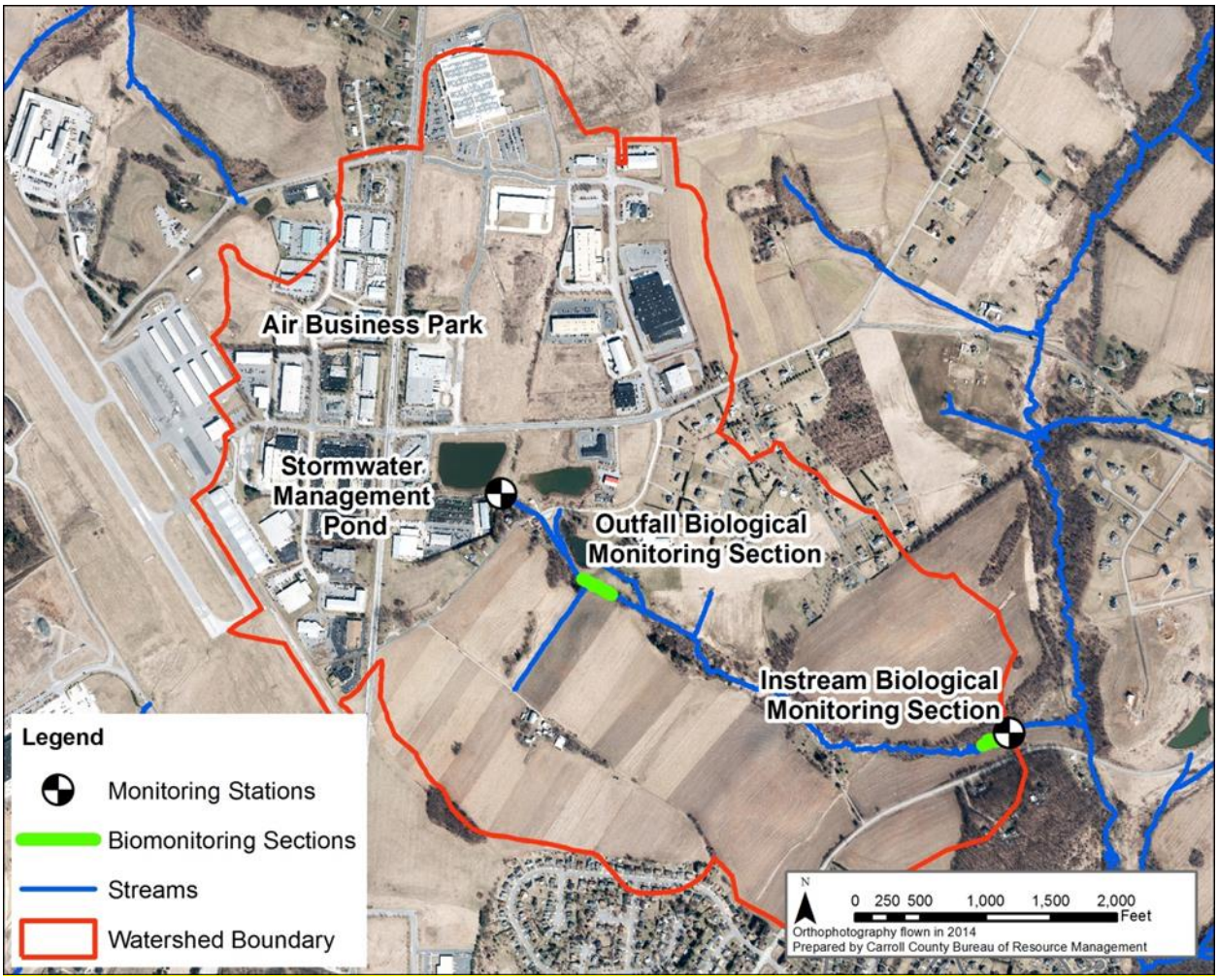


Figure 9: Biological Monitoring Station Locations

Table 14
MBSS Scoring Criteria for the Piedmont Region

Metric	IBI Score 5	3	1
Number of Taxa	≥25	15-24	<15
Number of EPT	≥11	5.0-10.0	<5
Number of Ephemeroptera	≥4	2.0-3.0	<2
% Intolerant Urban (Tolerance Values 0-3)	≥51	12.0-50	<12
% Chironomidae	≤4.6	4.7-63	>63
% Clingers	≥74	31-73	<31

Table 15
IBI Score Ranges and Corresponding Narrative Ratings

IBI Score Range	Narrative Rating	Interpretation
4.0-5.0	Good	Comparable to reference streams considered to be minimally impacted.
3.0-3.9	Fair	Comparable to reference conditions, but some aspects of biological integrity may not resemble the qualities of these minimally impacted streams.
2.0-2.9	Poor	Significant deviation from reference conditions, with many aspects of biological integrity, not resembling the qualities of these minimally impacted streams, indicating some degradation.
1.0-1.9	Very Poor	Strong deviation from reference conditions, with most aspects of biological integrity, not resembling the qualities of these minimally impacted streams, indicating severe degradation.

The assessment of spring habitat also utilized guidance from the 2014 Maryland Biological Stream Survey (MBSS) Sampling Manual: Field Protocols. This approach is entirely subjective and bias is often high with this approach depending on the assessor(s) and other factors. The scoring criteria measures eight parameters as shown in **Table 16**. Each parameter can be scored a maximum of 20 points for a total maximum score of 160 points. Each parameter is subdivided into narrative ratings of poor, marginal, sub-optimal, and optimal.

Table 16
MBSS Habitat Assessment Criteria
(MBSS Sampling Manual Field Protocols, 2014)

MBSS Stream Habitat Assessment Guidance Criteria Sheet				
Habitat Parameter	**Optimal 16-20**	**Sub-Optimal 11-15**	**Marginal 6-10**	**Poor 0-5**
1. Instream Habitat	Greater than 50% of a variety of cobble, boulder, submerged logs, undercut banks, snags, root wads, aquatic plants, or other stable habitat	30-50% of stable habitat. Adequate habitat	10-30% mix of stable habitat. Habitat availability less than desirable	Less than 10% stable habitat. Lack of habitat is obvious
2. Epifaunal Substrate	Preferred substrate abundant, stable, and at full colonization potential (riffles well developed and dominated by cobble; and/or woody debris prevalent, not new, and not transient)	Abund. Of cobble with gravel &/or boulders common; or woody debris, aquatic veg., undercut banks, or other productive surfaces common but not prevalent/suited for full colonization	Large boulders and/or bedrock prevalent; cobble, woody debris, or other preferred surfaces uncommon	Stable substrate lacking; or particles are over 75% surrounded by find sediment or flocculent material
3. Velocity/Depth Diversity	Slow (<0.3 m/s), deep (>0.5 m); slow, shallow (<0.5m); fast (>0.3 m/s), deep; fast, shallow habitats all present	Only 3 of the 4 habitat categories present	Only 2 of the 4 habitat categories present	Dominated by 1 velocity/depth category (usually pools)
4. Pool/Glide/Eddy Quality	Complex cover/&/or depth > 1.5m; both deep (>.5 m)/shallows (<.2 m) present	Deep (>0.5 m) areas present; but only moderate cover	Shallows (<0.2 m) prevalent in pool/glide/eddy habitat; little cover	Max depth <0.2 m in pool/glide/eddy habitat; or absent completely
5. Riffle/Run Quality	Riffle/run depth generally >10 cm, with maximum depth greater than 50 cm (maximum score); substrate stable (e.g. cobble, boulder) & variety of current velocities	Riffle/run depth generally 5-10 cm, variety of current velocities	Riffle/run depth generally 1-5 cm; primarily a single current velocity	Riffle/run depth < 1cm; or riffle/run substrates concreted
6. Embeddedness	Percentage that gravel, cobble, and boulder particles are surrounded by line sediment or flocculent material			
7. Shading	Percentage of segment that is shaded (duration is considered in scoring). 0% = fully exposed to sunlight all day in summer; 100% = fully and densely shaded all day in summer			
8. Trash Rating	Little or no human refuse visible from stream channel or riparian zone	Refuse present in minor amounts	Refuse present in moderate amounts	Refuse abundant and unsightly

3. Results and Discussion

Climatological

Monthly precipitation data for the 2017 – 2018 reporting year are summarized in **Figure 10**. Also included for reference are 30 year monthly averages and monthly high and low extremes from the previous 28 years that local data are available. The total precipitation for the reporting period was 46.94 inches, a 3.54 inch surplus from the normal yearly total. Relative to normal monthly average precipitation, June 2018 was the wettest month with a surplus of 2.64 inches

while December 2017 was the driest month with a deficit of 2.45 inches. This reporting year was the fifth wettest year for total precipitation since reporting began at this station in 2000.

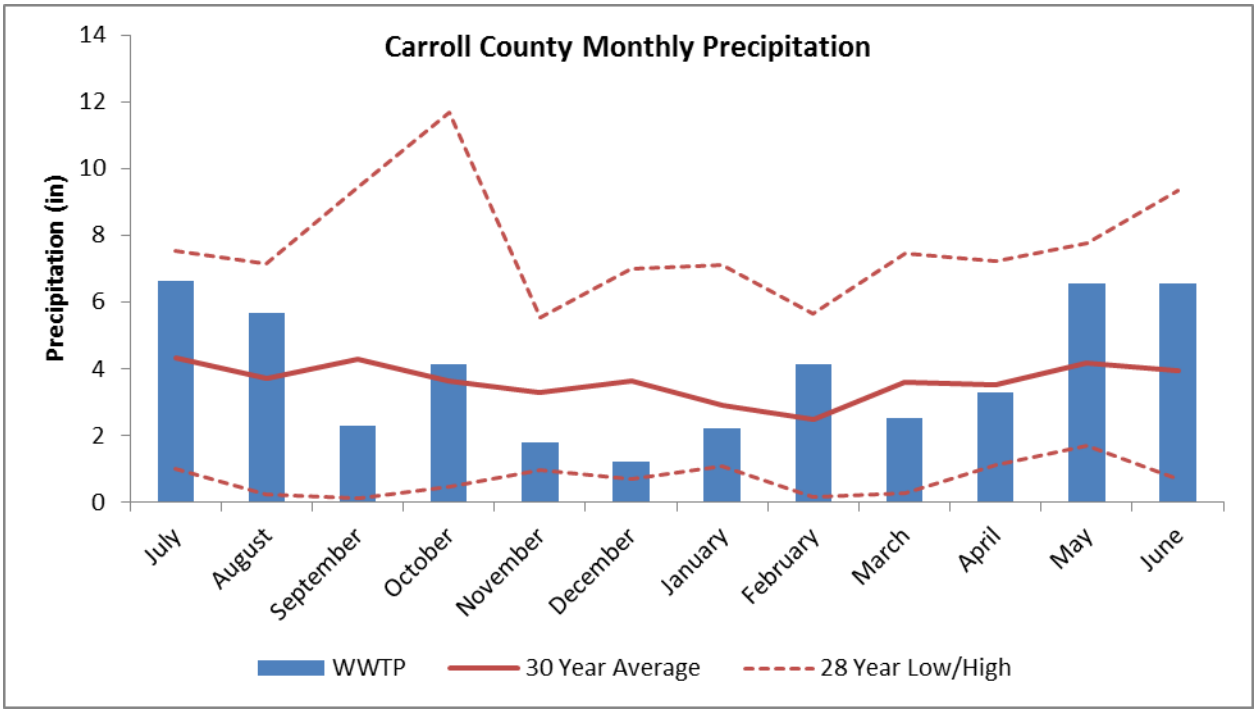


Figure 10: Monthly Precipitation Summary for the 2017 – 2018 Reporting Period

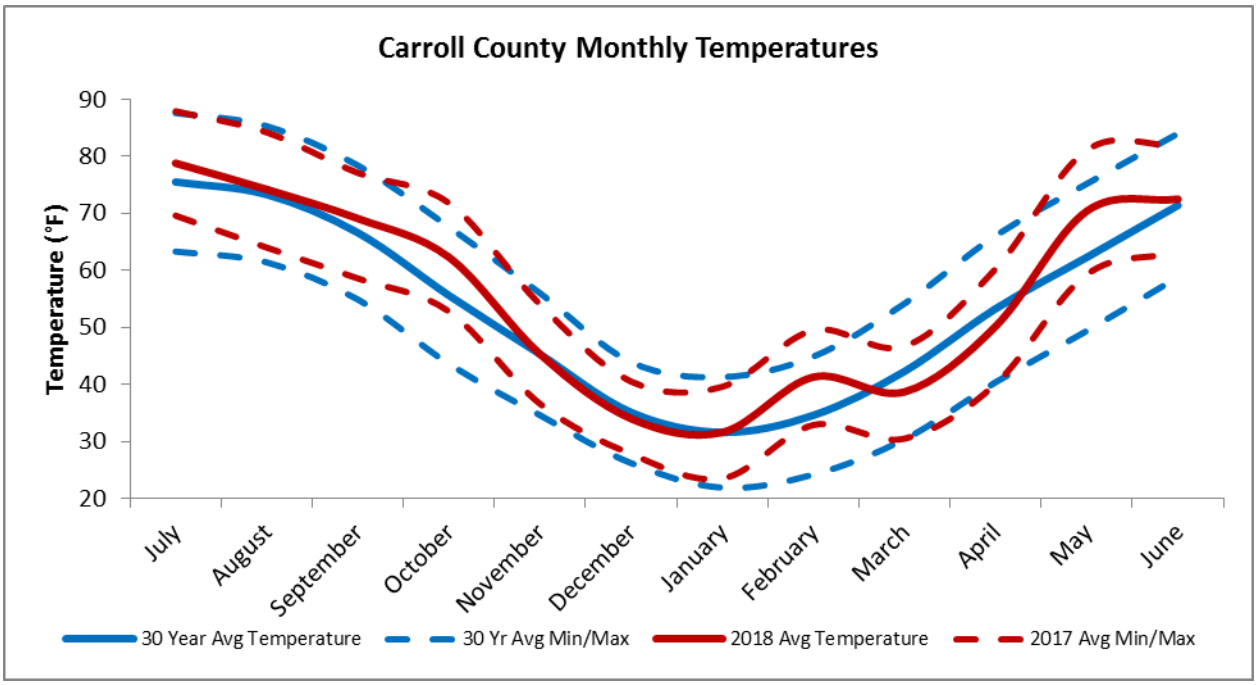


Figure 11: Monthly Temperature Summary for the 2017 – 2018 Reporting Period

Monthly temperature data for the 2017 – 2018 reporting year are summarized in **Figure 11**. The 30 year monthly average temperatures are included for reference. Overall, the reporting period experienced an annual average temperature of 55.7°F, 1.8 degrees warmer than the 30 year annual average. 7 of the 12 months were warmer than average with those months averaging 4.2 degrees warmer than normal. 3 of the 12 months were cooler than average with those months averaging 2.6 degrees cooler than normal. 2 months, November and January, were identical to the 30 year average monthly temperatures. October 2017, February 2018, and May 2018 in particular were significantly warmer than normal with a 6.7, 6.7, and 8.1 degree increase, respectively, from normal temperatures. It should be noted that warmer than average daily minimum temperatures were observed for every month except April 2018; the average for this reporting period was 4.1 degrees above normal.

Hydrological

Hydrographs have been prepared for stage height and discharge for each monitoring station during the reporting period. Instream and outfall stage heights and discharge measurements, in addition to daily precipitation totals, are shown in **Figures 12 and 13,** respectively. A surplus of 3.54 inches of precipitation was observed during this reporting period relative to a normal year. The reporting period had several large storm events and a relatively high frequency of smaller storm events, primarily in the wetter periods during Summer 2017 and Spring 2018. It should be noted that weir height at the instream station was lowered on September 22, 2016 to maintain stability and reduce leakage. A new rating curve (R^2=0.99) was used after this date to estimate discharge.

Storage by the stormwater facility results in peak stage heights less than 0.5 feet at the outfall station except for two storm events on June 2-3, 2018 when 2.55 inches of precipitation was recorded, and June 22-24, 2018 when 1.24 inches of precipitation was recorded during three successive intense storms. The stage reached peak height at close to 0.55 feet with a maximum discharge of 2,026 gallons per minute (gpm). Baseflow at the outfall monitoring station was marginal, typically with a stage height of 0.12 feet. The resulting baseflow discharge was approximately 76 gpm. In general, the storm events were more frequent and slightly more intense than previous years with a higher than normal baseflow.

Typical stage heights observed for the instream monitoring station were approximately 0.28 feet, or 230 gpm. During the June 2-3 storm event, stage height reached the peak for the reporting year at 1.49 feet. The resulting discharge was 17,130 gpm. There was only one other storm event during this time where stage heights above 1 foot (7,833 gpm) were observed. This occurred on May 19, 2018, with peak discharges of 9,451 gpm.

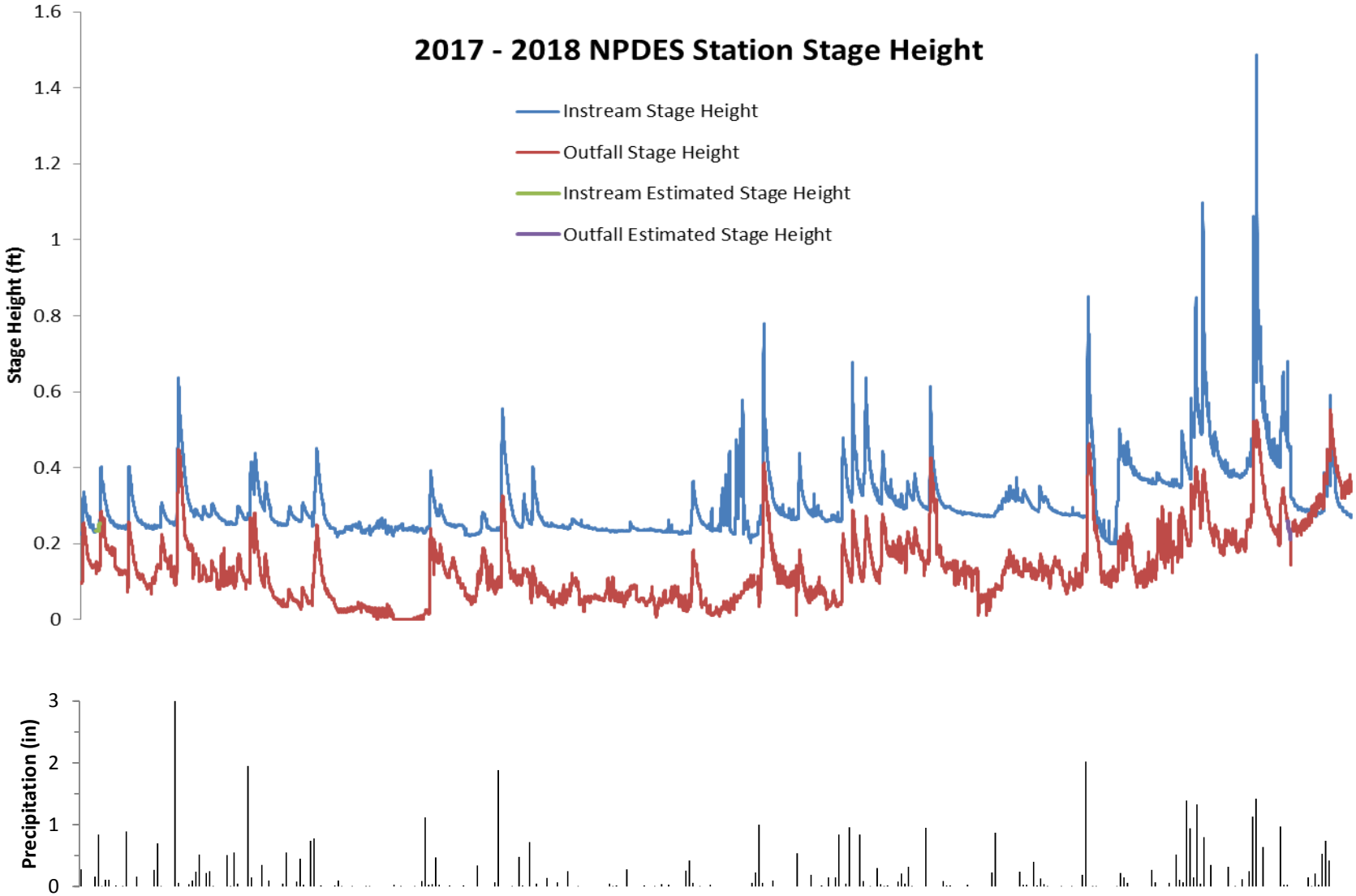


Figure 12: Stage Heights and Daily Precipitation for NPDES Monitoring Stations for the 2017 – 2018 Reporting Year

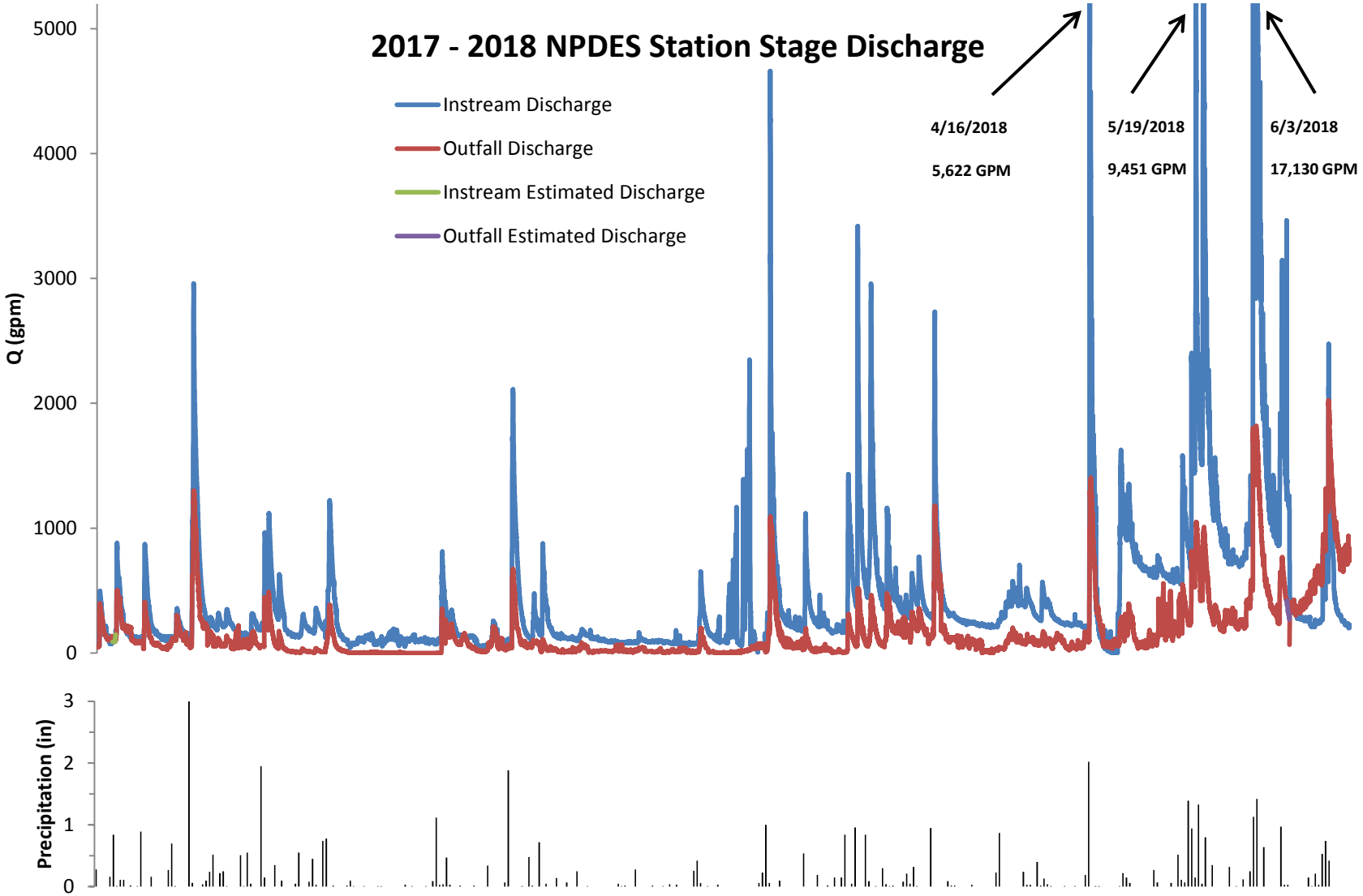


Figure 13: Discharge and Daily Precipitation for NPDES Monitoring Stations for the 2017 – 2018 Reporting Year

Total, seasonal, and categorical discharges for each monitoring station can be found in **Table 17**. Overall, 39% of the discharge from the instream station was contributed from the stormwater pond (outfall station). The total discharge from the instream station during this reporting year was approximately 228 million gallons with 88 million gallons being contributed in total discharge from the outfall station. Over half of the total discharge occurred during the spring months. During wetter periods such as Summer 2017 and Spring 2018, the outfall contributed greater percentage of total instream discharge (41-44%). During the drier periods such as Autumn 2017 and Winter 2018, the outfall contributed a lesser percentage of total instream discharge (29-30%).

Please note that stage heights and discharges from both stations were periodically estimated. These data were lost due to equipment failure. Additionally, the instream station weir height was adjusted and a new rating curve (R^2=0.99) was established after September 22, 2016.

Table 17
Categorical Discharges and Stage Heights for the 2017 – 2018 Reporting Year

	Instream	Outfall	Difference	Outfall Contribution (%)
Total (gallons)	228,205,850	88,110,577	140,095,273	39
Avg Stage (ft)	0.31	0.14	0.17	-
Median Stage (ft)	0.28	0.12	0.16	-
Avg Q (gpm)	434	168	267	39
Median Q (gpm)	230	76	154	33
Summer Q (gallons)	33,773,340	13,758,077	20,015,263	41
Autumn Q (gallons)	21,557,595	6,220,317	15,337,278	29
Winter Q (gallons)	56,151,247	16,739,264	39,411,984	30
Spring Q (gallons)	116,723,668	51,392,920	65,330,748	44
Dry (<700gpm)	103,545,641	44,869,778	58,675,862	43
Wet (>700gpm)	124,660,209	43,240,799	81,419,410	35

To compare pre and post pond retrofit hydrology, cumulative discharge frequency was plotted in **Figure 14**. This figure compares the discharge frequencies from the outfall monitoring station for the 2006 – 2007 and 2017 – 2018 reporting years. The maximum discharge during the pre-retrofit period (2007) was an order of magnitude higher than the post-retrofit period (2018). The maximum discharge in 2007 was 23,537 gpm while the maximum in 2018 was only 2,026 gpm. Additionally, the frequency and magnitude of high discharge events was greater during the pre-retrofit period. 58% of all discharge measurements were below or equal to 100 gpm. This contrasts with the pre-retrofit measurements where only 23% of measurements were below 100 gpm. 10% of all measurements in 2007 were greater than 2,000 gallons per minute, which are greater in magnitude than most of the highest discharges from 2018. Only 1.25 hours during one storm event did the outfall discharge exceed 2,000 gallons per minute in the 2018 reporting year.

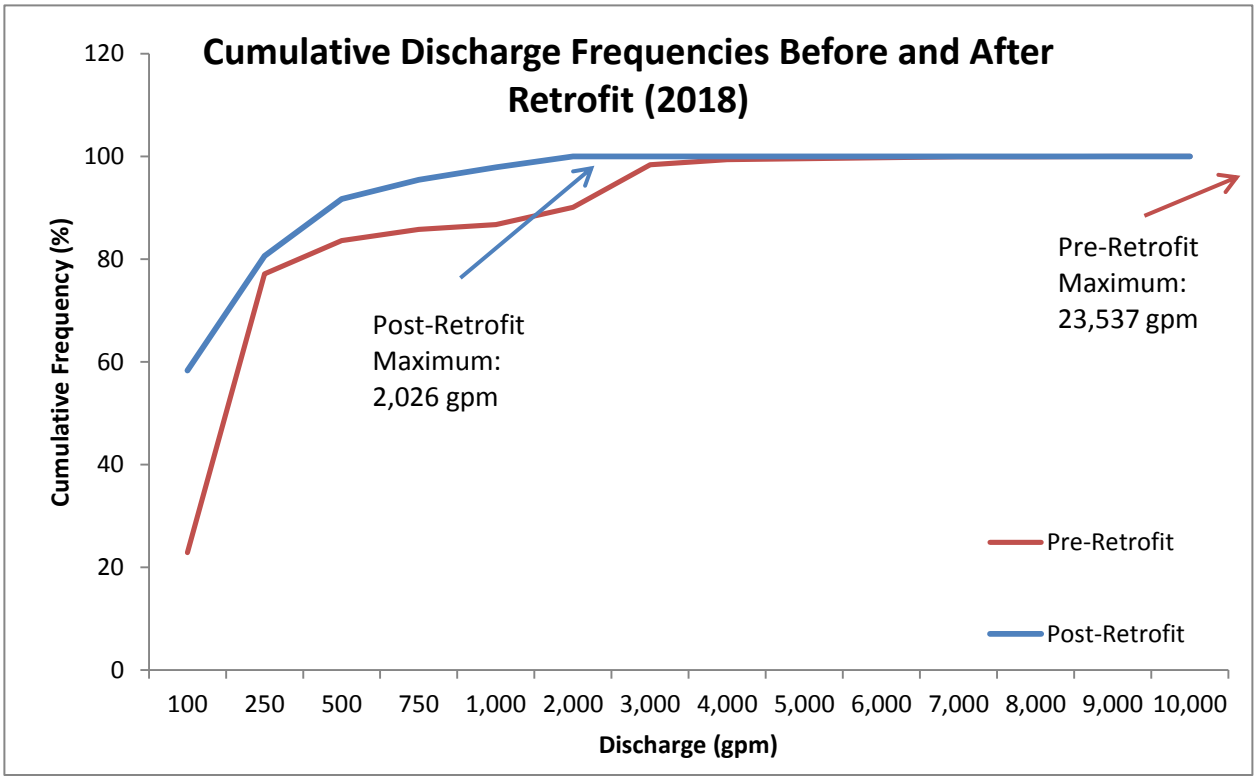


Figure 14: Outfall Discharge Frequencies for 2007 and 2018

Looking at individual components of the hydrograph allows one to observe the distinct mechanism behind any changes in cumulative frequencies throughout the year. **Figure 15** represents two analogous storm events, one before and one after the stormwater retrofit, and a hydrological comparison therein. This figure contains hydrographs before and after retrofit for instream and outfall stage heights and discharges. Unlike previous years which compared storm events with nearly identical precipitation totals, this comparison is of a larger storm event to the same pre-retrofit storm. The pre-retrofit event had 0.39 inches of precipitation observed while the post-retrofit event had 0.35 inches of precipitation observed. The post-retrofit storm was a higher intensity event despite having a lower precipitation total. Despite the higher precipitation intensity, the ascending limb for the post-retrofit outfall station still had a lower slope and peak discharge than the hydrograph of the pre-retrofit outfall station. The outfall to instream station discharge ratio for the post-retrofit storm event averaged a ~17% contribution, peaking at 35% as was roughly the case for the overall discharge and separated stormflow for the reporting period. During the pre-retrofit storm however, the outfall station contributed ~70% of the total instream discharge. The lesser contribution during the post-retrofit storm event is evident in the instream station hydrographs. The post-retrofit storm event at the instream station has a lower volume discharged compared to the pre-retrofit storm. The storm hydrographs look similar apart from the lesser volume. The period of baseflow recession after the storm event was similar to the pre-retrofit storm as well. Overall, longer baseflow recessions and lower peak discharges were observed with the current stormwater configuration.

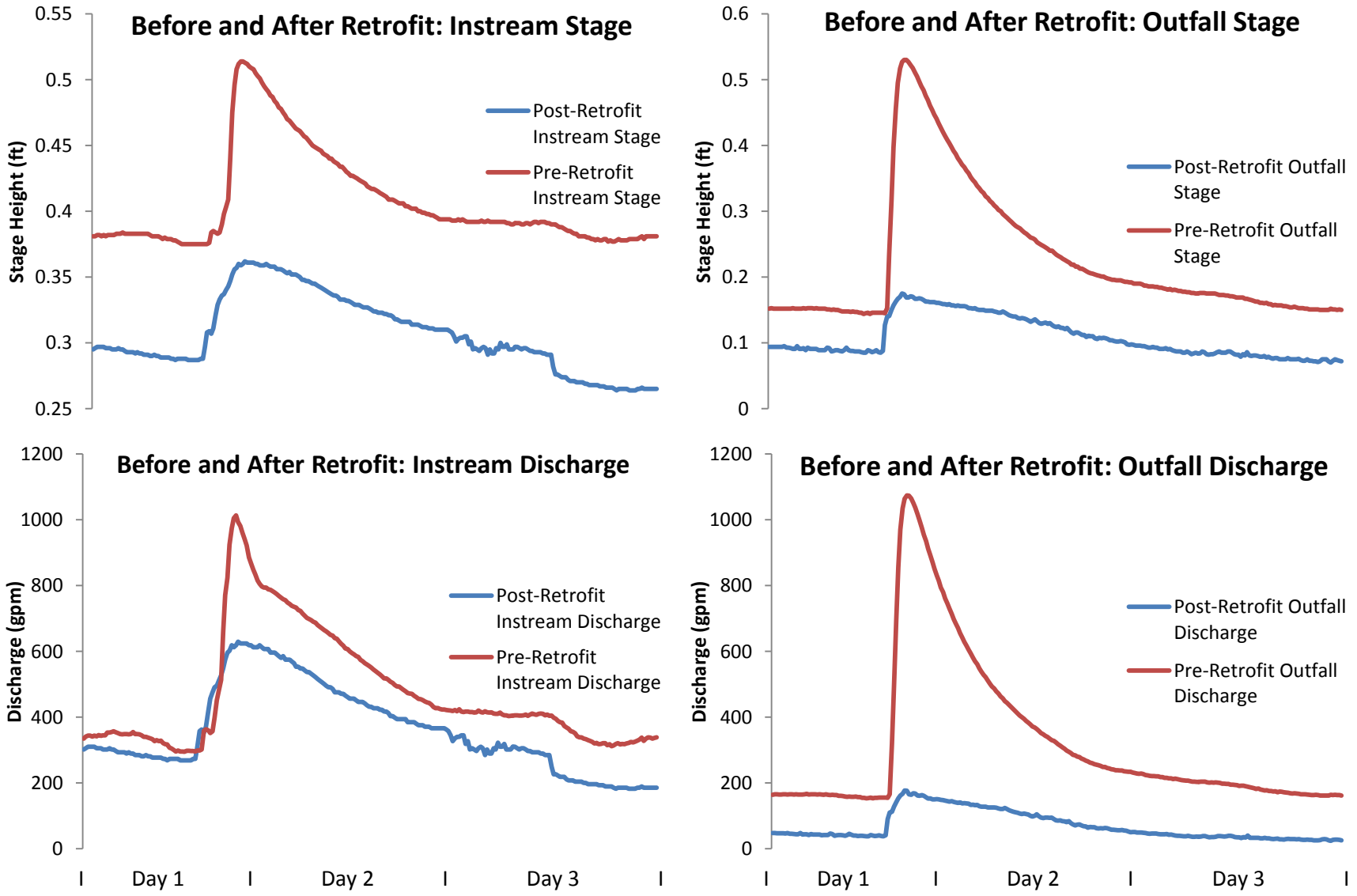


Figure 15: Characteristics of Analogous Storms Pre-Retrofit (7/23/2006, 0.39") and Post-Retrofit (8/22/2017, 0.35")

Geomorphological

The physical stream assessment consists of evaluating the six monumented cross-sections and 28 sections for stream physical character, shape, and slope. Physical data collection stations are shown in **Figure 16**.

Results from this year's monumented cross-section data collection are provided in **Appendix D**. Since this monitoring effort is in part designed to detect changes to the stream system over time, staff compared results from this year at the six permanent cross-sections with results from 2000, the initial year this type of monitoring was initiated.

There does not appear to be large scale degradation or aggradation of the stream channel in the last 18 years. At the first cross-section, located approximately 500 feet downstream of the pond outfall, the left bank has moved approximately two to three feet to the west, but has not experienced any down-cutting. Aggradation along the right edge was observed at this location and it now has a much steeper bank. This section is located approximately 200 feet downstream of a road culvert, and just upstream of the input location from the West Branch Stormwater Management Pond.

Cross-sections two and three are still generally unchanged since 2000, with only minor changes in stream channel shape. Located approximately 65 feet downstream of a series of bends and two draws, section four has shown relatively significant aggradation and narrowing of the channel since 2000. The channel bottom and associated floodplain have been elevated by almost one foot since 2000. In the past year, the channel bottom has moved slightly, cutting and steepening the left bank. This aggradation explains the reduction of stream gradient from approximately 1% to 0% over the previous 11 years. Section five is essentially unchanged since 2000; however, the channel has widened and moved slightly west over the last 18 years. Over the past year, some aggradation occurred along the east bank, narrowing the channel slightly.

Consistent with past findings, analysis at monumented cross-section six indicates that the stream channel has widened by four feet since 2000, extending from a width of five feet to a width of nine feet. This width is unchanged during the past several years. This monumented cross-section is located approximately 200 feet upstream of the confluence on a straight reach of stream that precedes a series of bends. As is discussed below, this region of the stream has the steepest slope and corresponding highest energy for stream bank erosion. Bank soils in this area are of the Manor Series, which is characterized as highly erodible (USDA, 1969).

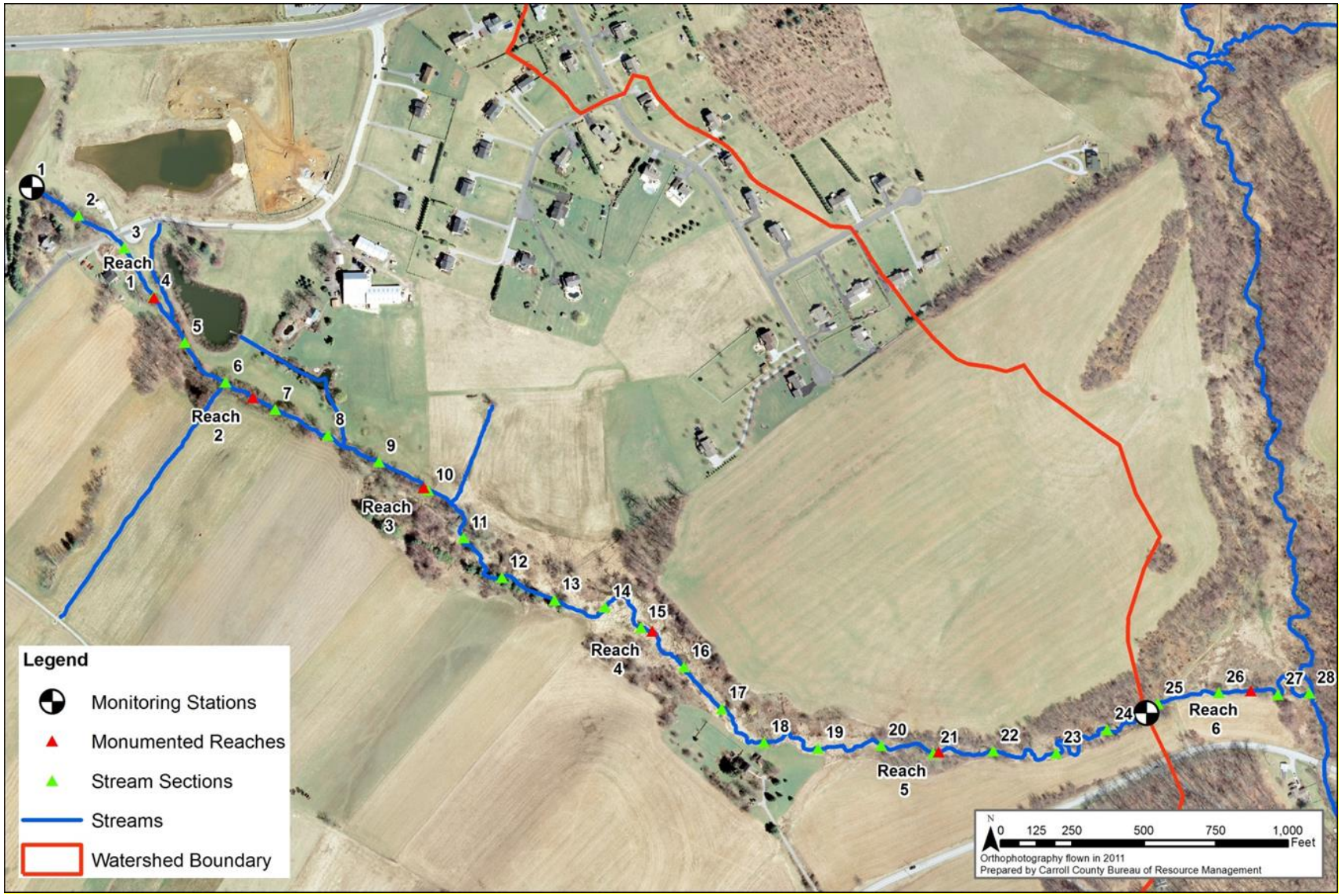


Figure 16: Physical Data Collection Stations

Table 18 displays thalweg elevation and section gradient for selected years from 2004 through 2018. One notable observation from the table is the low gradients found in the center section of the tributary. This observation coincides with the section four stream survey which discovered locally significant sediment deposition from year to year, which one would expect to find in an area with low gradients. **Figure 17** displays stream gradients from the current reporting year (2018), 2017, and 2004 as a longitudinal profile along with the locations of the six monumented stream reaches. The overall average gradient has remained unchanged over this period and has remained a gentle slope with only one section above a two percent gradient, but some individual sections have changed significantly. In general, increases in gradient between stations are indicative of higher energy and potential for increased channel scour. The first third of the stream profile has remained relatively unchanged during this period, but the gradient is generally higher than that of the final two thirds of the tributary. This can be seen in the survey of monumented section one where the stream channel has moved laterally approximately two to three feet over this period. The gradient has changed significantly over the second third of the stream profile and ranges from 0.02% to 1.26%. These ever-changing low gradients can explain why there is so much deposition at monumented section four which has roughly a flat gradient. The final third of the stream profile changes gradient a number of times, but slopes are relatively similar for 2018 and 2004; the slope at station 22 has a decreasing gradient while station 24 has an increasing gradient over time. **Figure 18** displays the longitudinal stream profile for elevation and depth of deposition or incision at each of the 28 sections along the profile. Included are the six monumented reaches for reference. The profile shows the low gradients in the center section of the stream and that the areas with lowest gradient have moved down stream, the cause of elevated deposition at monumented reach four. Aggradation and degradation is most significant in the center section of the stream. For the first time in ten years, one station (22) has exceeded one foot elevation change for this reporting year, but most stations are significantly less. Since the stream has two small tributaries, varying bends and straight segments, as well as a number of soils series represented along the channel, it is important to monitor the physical characteristics of the stream channel over time.

Table 18
Cross-Section Station Results for Selected Years 2004 – 2018

		2018		2017		2012		2010		2008		2006		2004	
Station	**Distance (ft)**	**Elev**	**Slope**	**Elev**	**Slope**	**Elev**	**Slope**	**Elev**	**Slope**	**Elev**	**Slope**	**Elev**	**Slope**	**Elev**	**Slope**
1	0							730.89		730.89		730.68		730.89	N/A
2	201	728.12		728.15		728.04		728.01	1.43%	728.01	1.43%	727.83	1.42%	727.90	1.49%
3	394	724.99	1.62%	725.19	1.54%	724.73	1.72%	724.58	1.78%	724.56	1.79%	724.26	1.85%	724.20	1.92%
4	592	721.86	1.58%	721.87	1.68%	721.86	1.45%	722.06	1.27%	721.49	1.55%	721.30	1.50%	721.51	1.36%
5	786	718.15	1.91%	718.11	1.93%	717.91	2.03%	717.78	2.20%	717.81	1.89%	717.77	1.81%	717.75	1.93%
6	988	716.16	0.99%	716.14	0.98%	715.84	1.03%	716.73	0.52%	716.61	0.59%	716.27	0.74%	715.82	0.96%
7	1184	715.75	0.21%	715.75	0.20%	715.55	0.15%	715.58	0.59%	715.70	0.46%	715.60	0.34%	715.49	0.17%
8	1388	714.38	0.67%	714.36	0.68%	714.18	0.67%	714.28	0.64%	714.24	0.72%	714.30	0.64%	714.42	0.52%
9	1589	713.02	0.68%	713.27	0.54%	712.89	0.64%	712.80	0.74%	712.78	0.73%	712.83	0.73%	712.74	0.84%
10	1787	711.24	0.90%	711.27	1.01%	711.40	0.75%	711.59	0.61%	711.66	0.57%	711.20	0.82%	711.22	0.77%
11	1986	709.89	0.68%	709.77	0.76%	710.28	0.56%	709.93	0.84%	710.06	0.81%	709.58	0.82%	709.61	0.81%
12	2189	709.41	0.24%	709.39	0.19%	709.32	0.47%	709.16	0.38%	709.58	0.24%	709.02	0.28%	709.48	0.06%
13	2386	708.70	0.36%	708.60	0.40%	708.61	0.36%	708.46	0.35%	709.04	0.27%	709.81	-0.40%	709.45	0.02%
14	2564	708.40	0.17%	708.50	0.06%	708.30	0.18%	708.17	0.16%	707.88	0.66%	707.94	1.06%	707.74	0.97%
15	2707	707.26	0.79%	707.25	0.87%	707.45	0.59%	707.02	0.80%	707.06	0.57%	707.07	0.61%	706.81	0.65%
16	2910	705.42	0.91%	705.40	0.91%	705.58	0.92%	705.44	0.78%	705.55	0.74%	705.20	0.92%	705.18	0.80%
17	3106	704.49	0.48%	704.58	0.42%	704.64	0.48%	704.78	0.34%	704.48	0.55%	704.37	0.43%	704.18	0.51%
18	3298	703.57	0.48%	703.68	0.47%	703.43	0.63%	703.62	0.60%	703.27	0.63%	703.16	0.63%	702.94	0.64%
19	3490	701.83	0.91%	701.84	0.96%	701.85	0.82%	701.75	0.97%	701.48	0.93%	701.48	0.88%	701.69	0.65%
20	3704	699.16	1.25%	699.10	1.28%	699.07	1.30%	698.90	1.33%	698.92	1.19%	698.92	1.19%	698.99	1.26%
21	3896	697.78	0.72%	697.96	0.60%	697.74	0.69%	697.73	0.61%	697.69	0.64%	697.83	0.57%	697.95	0.54%
22	4100	695.79	0.97%	695.43	1.24%	694.91	1.39%	694.70	1.48%	694.78	1.42%	694.90	1.43%	694.62	1.63%
23	4320	694.22	0.71%	694.15	0.58%	693.92	0.45%	693.90	0.36%	693.73	0.48%	693.44	0.66%	693.42	0.54%
24	4511	691.24	1.56%	691.11	1.60%	691.04	1.51%	691.17	1.43%	691.10	1.38%	691.05	1.25%	691.12	1.21%
25	4717	689.57	0.81%	689.53	0.76%	689.31	0.84%	689.35	0.88%	689.41	0.82%	689.52	0.74%	689.65	0.71%
26	4933	687.55	0.94%	687.51	0.94%	687.38	0.90%	687.38	0.91%	687.59	0.84%	687.71	0.84%	687.59	0.96%
27	5137	685.78	0.87%	685.81	0.83%	685.47	0.94%	685.44	0.95%	685.45	1.05%	685.53	1.07%	685.82	0.87%
28	5248	683.37	2.16%	683.10	2.43%	682.93	2.28%	682.80	2.37%	682.70	2.47%	682.71	2.53%	682.83	2.68%

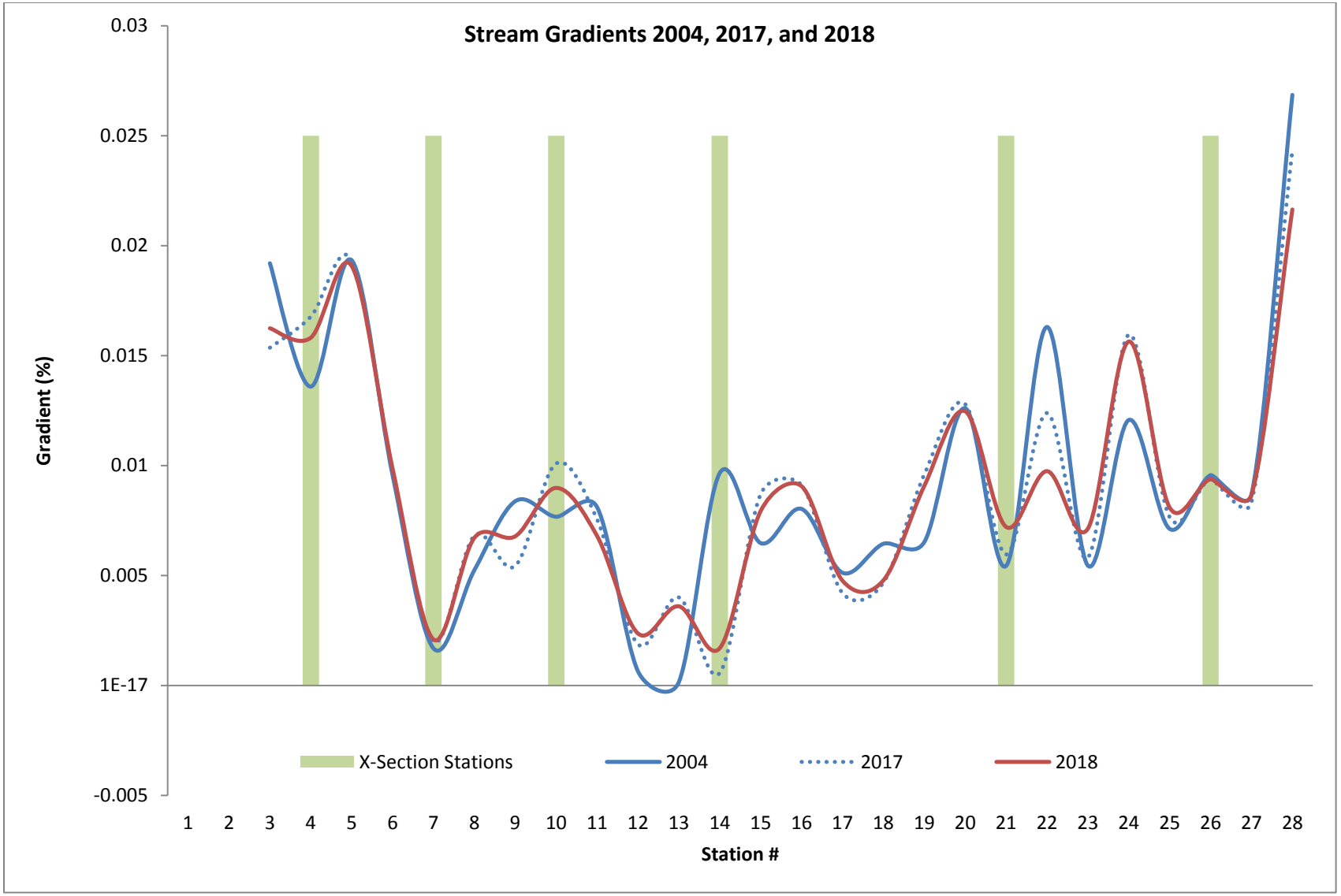


Figure 17: Stream Gradient Change from 2004 – 2018

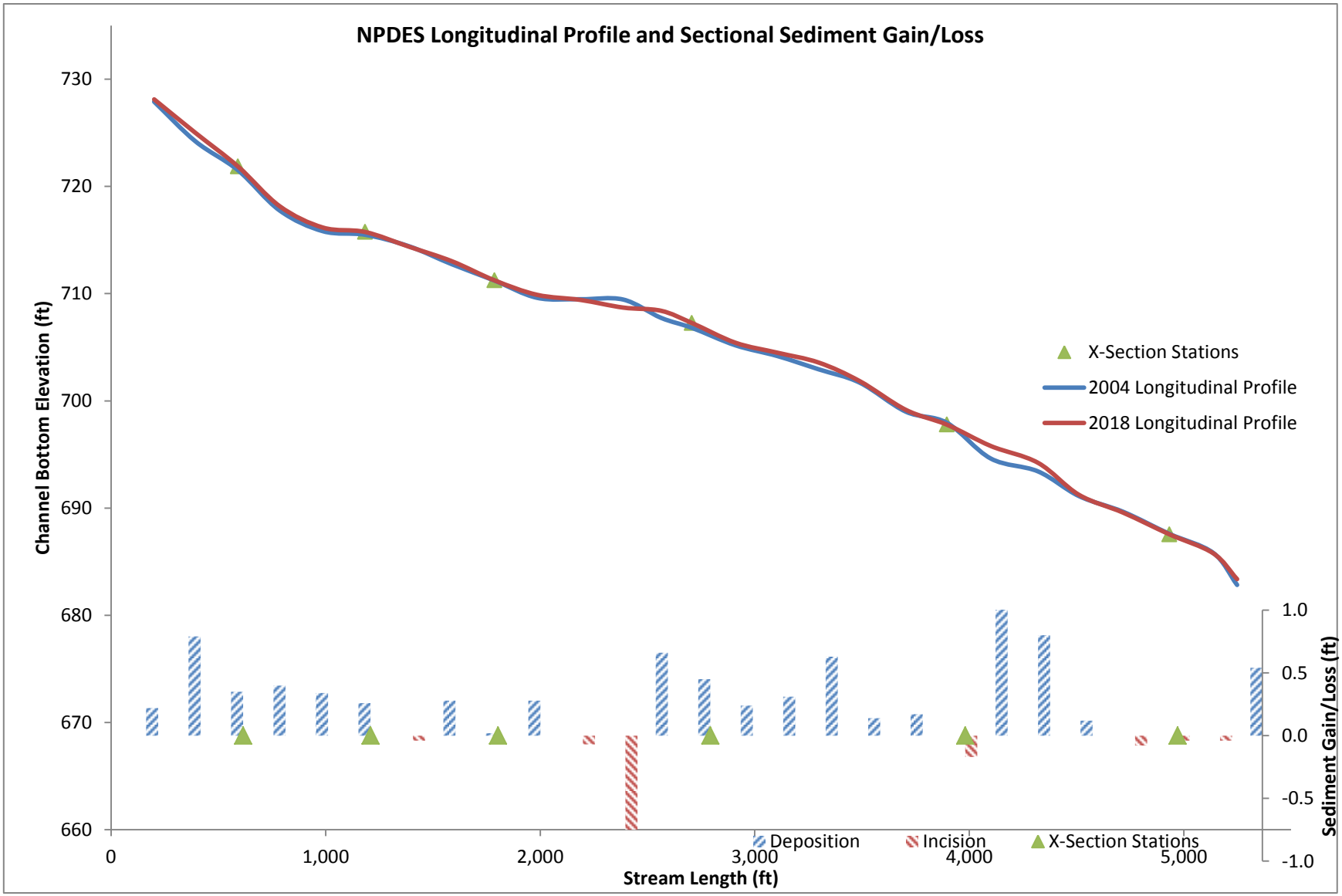


Figure 18: Comparison of Longitudinal Profile and Sectional Deposition/Incision from 2004 - 2018

Chemical

Physical Water Data

Physical water analysis results for both monitoring stations are displayed in **Table 19**. Overall, the outfall station water samples were more slightly more basic and exhibited higher temperatures and conductivities, apart from late summer/early autumn, as in previous years.

On average, temperatures at the outfall station were 6% warmer than those at the instream station. Temperature differences ranged from -4°F during base flow sampling in winter 2018 to 13°F during July 2017. The increased temperatures at the outfall station are most likely due to solar heating of water stored in the pond. Additionally, groundwater interaction and shading at and upstream of the instream station could be cooling the water relative to the outfall station.

Table 19
Physical Water Data for 2017 – 2018 Reporting Year

Event	Date	Event Type	Outfall Physical Water Data			Instream Physical Water Data		
			pH	Water Temp (F)	Conductivity (µmhos/cm)	pH	Water Temp (F)	Conductivity (µmhos/cm)
2017-09	7/6/2017	Storm	7.84	79	320	7.1	66	360
2017-10	7/20/2017	Base Flow	7.59	79	290	7.17	67	390
2017-11	7/28/2017	Storm	7.48	76	300	7.33	68	280
2017-12	8/17/2017	Base Flow	8.59	76	230	7.43	66	300
2017-13	9/19/2017	Base Flow	8.92	70	250	8.16	62	370
2017-14	10/9/2017	Storm	8.14	71	380	8.1	69	320
2017-15	10/19/2017	Base Flow	8.67	59	300	8.33	50	360
2017-16	10/29/2017	Storm	8.52	57	230	8.25	56	240
2017-17	11/16/2017	Base Flow	8.65	45	240	8.26	48	290
2017-18	12/19/2017	Base Flow	8.85	41	420	8.93	44	340
2018-01	1/23/2018	Storm	7.35	43	1300	7.12	42	450
2018-02	1/25/2018	Base Flow	7.62	38	1300	7.28	37	720
2018-03	2/15/2018	Base Flow	8.74	41	2500	8.09	45	970
2018-04	3/15/2018	Base Flow	9.31	36	1300	8.34	40	430
2018-05	3/21/2018	Storm	8.66	39	1231	7.57	39	548
2018-06	4/16/2018	Storm	8.43	52	1400	7.83	51	460
2018-07	4/24/2018	Base Flow	8.9	57	1100	7.72	51	460
2018-08	4/25/2018	Storm	8.21	57	980	7.79	53	410
2018-09	5/10/2018	Base Flow	8.76	68	980	8.35	58	430
2018-10	6/19/2018	Base Flow	8.14	77	380	7.1	66	370

Conductance was generally greater at the outfall station, 64% greater on average. Conductance ranged from 230 µmhos/cm to 2,500 µmhos/cm. Both stations displayed trends of elevated conductivities in the winter and spring and decreasing conductivity levels throughout the summer and autumn seasons suggesting that conductance levels may be influenced by de-icing operations during the winter months. In past years, pH measurements at the outfall were generally more basic with higher variance than those at the instream station. pH measurements at the outfall averaged 8.4 and the instream station averaged a pH of 7.8. The pH values ranged from 7.1 to 9.3 pH units. This pattern is typical as the pH at the outfall station is generally more basic; possibly due to the local goose population, biological activity within the pond, stormwater interaction with carbonate rocks and concrete used in the construction of the stormwater facility, and influence of roadway derived materials such as road salt.

Event Mean Concentrations

The event mean concentration (EMC) mean values and ranges observed for the 20 storm flow and baseflow events for this reporting year are displayed in **Table 20**. Of the observed analytes, Nitrate/Nitrite was the only one to show a significant difference between the two stations for this reporting year. In this case, Nitrates/Nitrites were significantly greater at the instream station.

Table 20
EMC Values for 2017 – 2018 Reporting Year

Event Mean Concentration		Outfall Station			Instream Station			Significance
Analyte	**Units**	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**	**p-value**
BOD	mg/L	2.75	2.00	4.27	3.22	2.00	8.14	0.266
TKN	mg/L	0.76	0.50	1.50	1.05	0.50	3.47	0.155
NO2/NO2	mg/L	0.20	0.05	0.56	4.08	0.83	7.20	$3.5x10^{-8}$
Phosphorus	mg/L	0.09	0.03	0.18	0.16	0.01	0.80	0.115
TSS	mg/L	19.28	3.00	39.00	113.98	1.00	645.64	0.023
Copper	µg/L	2.60	2.00	8.32	5.82	2.00	30.58	0.072
Lead	µg/L	2.18	2.00	5.52	3.86	2.00	17.82	0.083
Zinc	µg/L	21.89	20.00	34.66	32.74	20.00	97.64	0.051
TPH	mg/L	5.00	5.00	5.00	5.00	5.00	5.00	1

Figures 19 and 20 present annual mean EMC values for eight analytes from the 2001 through 2018 reporting years. Also presented are mean EMC values before and after the stormwater retrofit. The only analyte with a significant observed difference between the outfall and instream stations consistently from 2001 – 2018 was Nitrites/Nitrates; the pre and post retrofit graph reinforces this difference. Though not all mean EMC values were significantly different for the three metals at the instream station, all EMC values for Copper, Lead, and Zinc decreased at the outfall station after the retrofit. This is not unexpected given the increased residence within the stormwater facility. Please note that a single outlying measurement in July 2014 caused a large increase in average Zinc for that reporting year.

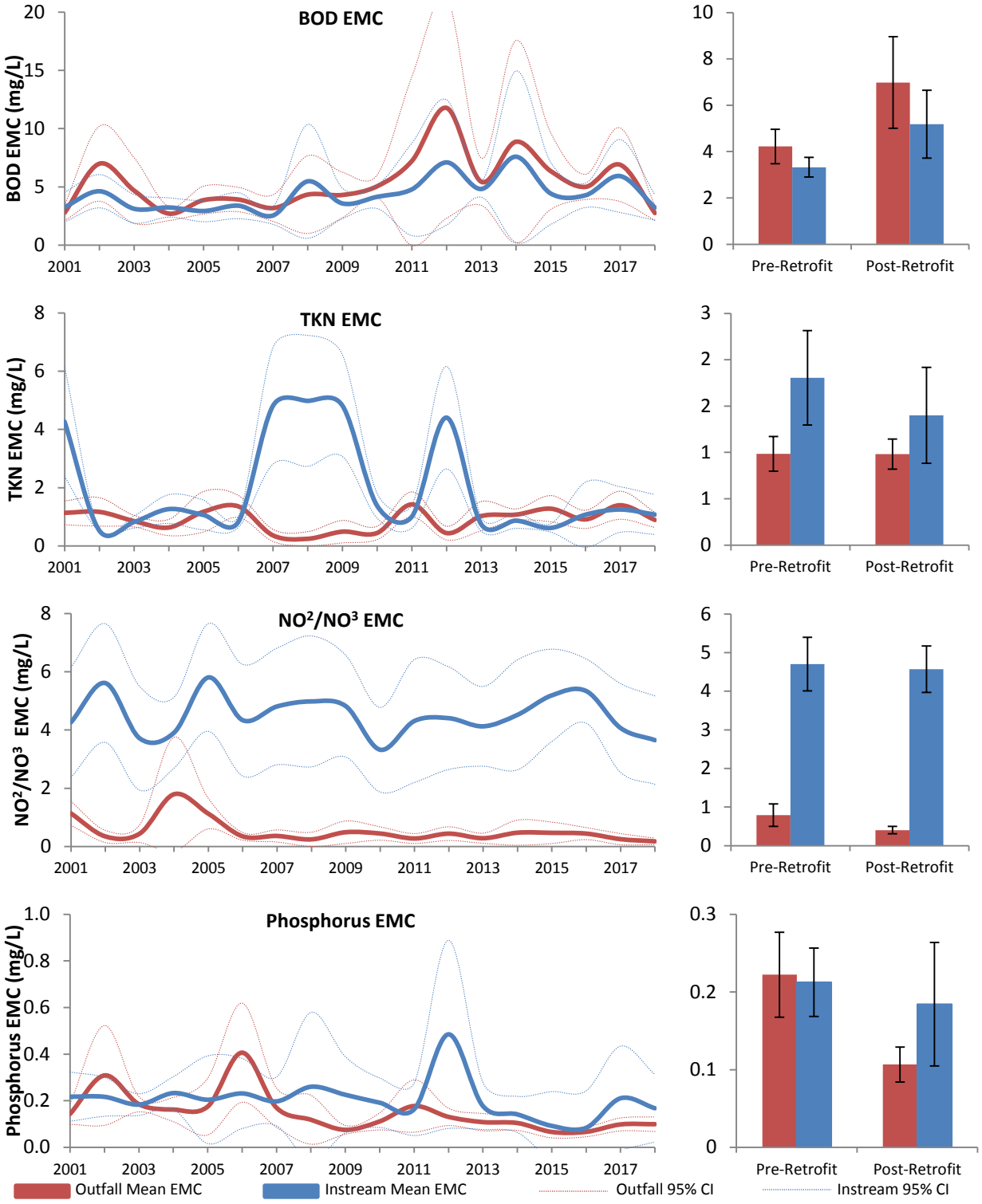


Figure 19: EMC Values from 2001 – 2018 for BOD, TKN, NO^2/NO^3, and Phosphorus

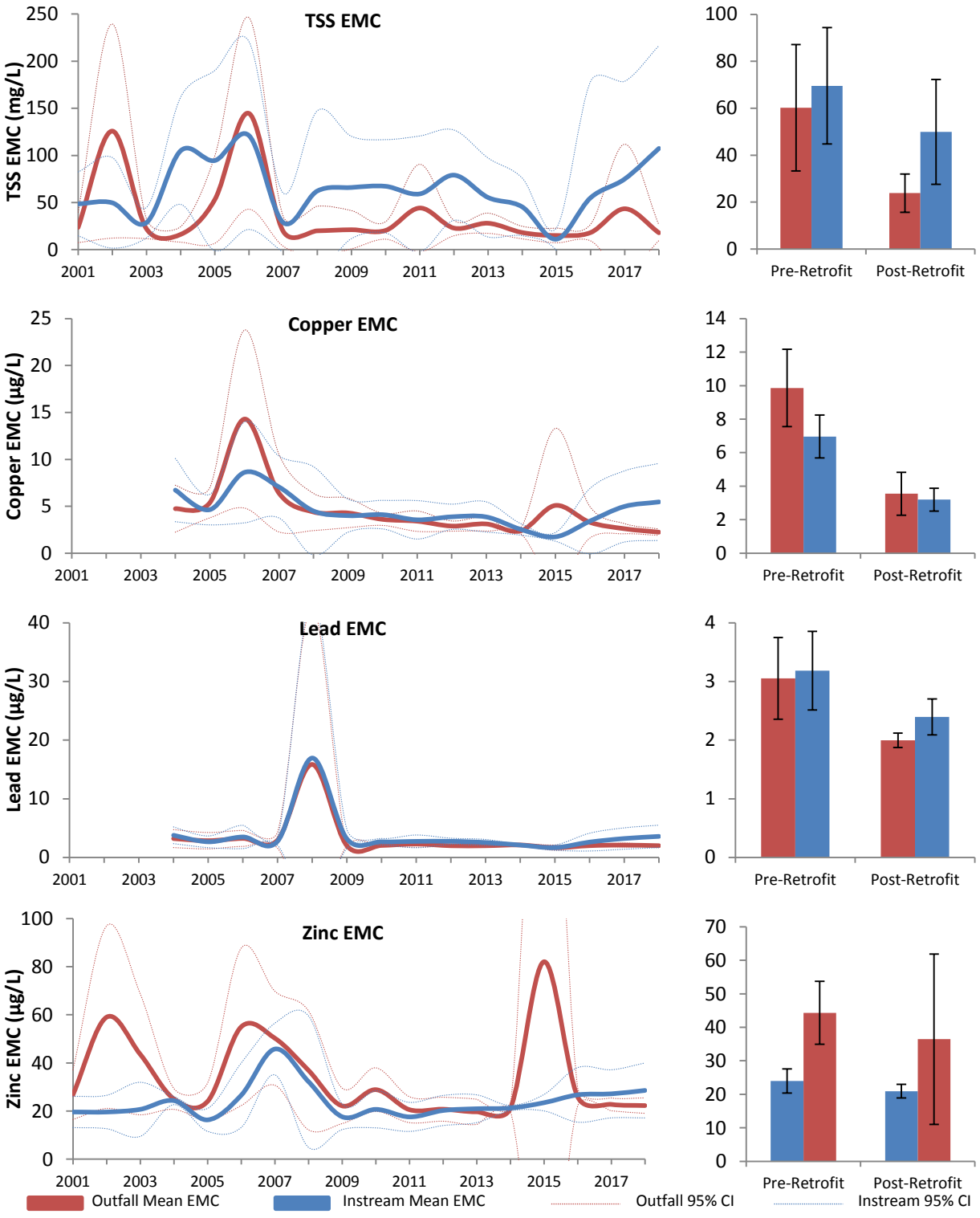


Figure 20: EMC Values from 2001 – 2018 for TSS, Copper, Lead, and Zinc

Annual Pollutant Loads

A discharge hydrograph was created for this reporting period for each monitoring station. Baseflow separation revealed that storm flow was evident above 700 gpm discharge at the instream station. Estimations for baseflow, storm flow, and total annual loading based on EMC values and discharge data are located in **Table 20**.

Expectedly, greater analyte loads were observed at the instream station. The contribution of analyte loading at the outfall station to total loading (instream station) decreases during storm flow. Similar to previous observations evident in **Figure 19**, outfall contribution of Nitrates/Nitrites were low overall. All other analytes had estimated outfall contributions during storm flow of 3% to 37%, lower than the previous year. TSS and Phosphorus had very small outfall contributions during storms, likely due to the operational efficiency of the stormwater facility and the high frequency of storm events during the reporting year. All analytes showed increases in outfall contribution during baseflow except for NO_2/NO_3. It should be noted that for loading calculation, the detection limit concentrations were used instead of zero values with samples below detection. Therefore, actual loadings are likely less than values displayed below. Additionally, all TPH samples were below detection.

Table 20
Annual Pollutant Loads for the 2017 – 2018 Reporting Year

Annual Pollutant Loading (lbs/Year)										
Loc.	Type	BOD	TKN	NO2/NO3	Phosphorus	TSS	Copper	Lead	Zinc	TPH
Instream	Base	2,148	432	4,153	27	4,902	1.7	1.7	17	4,321
	Storm	5,293	1,889	2,646	428	336,562	15.2	8.9	54	5,202
	Total	7,441	2,321	6,798	456	341,464	16.9	10.6	72	9,522
Outfall	Base	1,079	235	54	30	6,158	0.9	0.7	7	1,872
	Storm	1,028	212	68	34	9,615	0.9	0.7	8	1,675
	Total	2,107	447	122	63	15,773	1.8	1.5	16	3,547

Seasonal Pollutant Loads

Seasonal discharge for each monitoring station is provided in **Figure 21** for reference**.** The instream station unsurprisingly displayed greater discharges for each season; therefore it is not unexpected to have greater loadings. Seasonal loadings based on the EMC values and seasonal discharges from **Figure 21** are located in **Table 21**.

All analytes had the greatest loadings in the spring season. This is not surprising considering the spring season had the greatest total discharge of the reporting period. At the outfall station, no spring contributions were below 48%. Most analytes has a spring seasonal contribution around ~60% for yearly chemical loading. Spring loading contributions were even higher at the

instream station. Phosphorus, TSS, and Copper had a range of 81% to 85% of total chemical loading occur during the spring season. Loading during autumn was the lowest for all but one analyte due to lack of precipitation, while summer and winter loadings were mixed. Average loadings during autumn were generally 6% with loadings during summer and winter averaging around 15% of total yearly loading. The outfall station relatively consistently correlates to values estimated for the instream station. Observed loadings for TPH were highest in the spring season. It should be noted that for loading calculation, the detection limit concentrations were used instead of zero values with samples below detection. Therefore, actual loadings are likely less than values displayed below. All TPH samples were below detection during the reporting year so any differences are due to differences in flow volume.

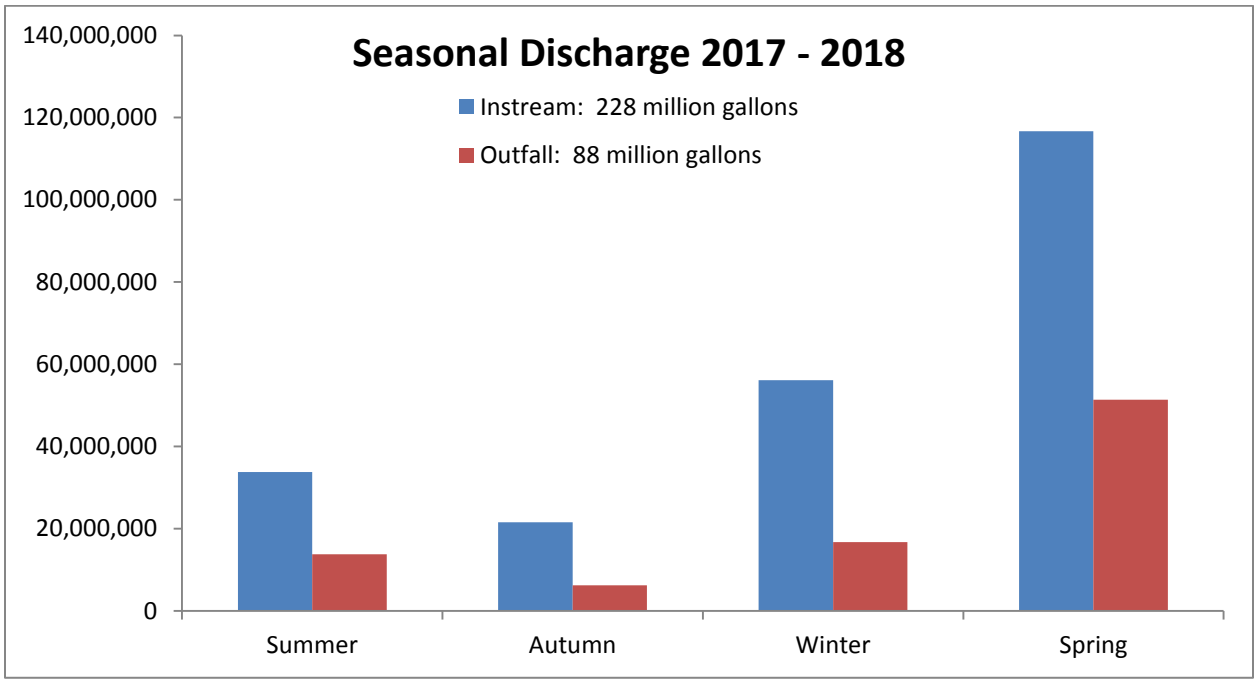


Figure 21: Seasonal Discharge for the 2017 – 2018 Reporting Year

Table 21
Seasonal Pollutant Loads for the 2017 – 2018 Reporting Year

Seasonal Pollutant Loading (lbs)										
Loc.	**Season**	**BOD**	**TKN**	**NO2/NO3**	**Phosphorus**	**TSS**	**Copper**	**Lead**	**Zinc**	**TPH**
Instream	Summer	762	270	1,050	39	24,164	1.2	0.8	7.4	1,409
	Autumn	457	142	988	16	9,498	0.7	0.5	4.5	900
	Winter	1,030	260	1,830	29	16,831	1.1	1.0	9.6	2,343
	Spring	5,192	1,649	2,931	371	290,971	13.9	8.2	50.2	4,871
	Total	7,441	2,321	6,798	456	341,464	16.9	10.6	72	9,522
Outfall	Summer	257	125	6	14	2,955	0.2	0.2	2.4	574
	Autumn	115	33	11	4	508	0.1	0.1	1.1	260
	Winter	352	75	47	10	2,027	0.3	0.3	2.9	569
	Spring	1,383	214	58	36	10,283	1.1	0.9	9.2	2,144
	Total	2,107	447	122	63	15,773	1.8	1.5	15.7	3,547

Biological

A complete list of species found at each site and the frequency of their occurrence can be found in **Appendix E**. MBSS scoring criteria for the genus level benthic macro-invertebrate Index of Biotic Integrity (IBI) for the Eastern Piedmont region of Maryland is shown in **Table 14**. An IBI score was calculated for each station by dividing the total score by the six metrics used for this index, thus deriving an average IBI score. Corresponding narrative ratings were also determined for each station in accordance with Maryland Biological Stream Survey Standards. The narrative rating guidelines can be found in **Table 15.**

The biological health of the outfall and instream monitoring stations are summarized by **Tables 22 and 23**, respectively. The stations for the 2018 reporting year displayed fair and poor health ratings. The outfall station had an IBI score of 2.33 while the instream station had an IBI score of 3.

Table 22
Outfall Station IBI Score for the 2017 – 2018 Reporting Year

Metric	Result	Score
Number of Taxa	25	5
Number of EPT	4	1
Number Ephemeroptera	0	1
% Intolerant Urban	0	1
% Chironomidae	62	3
% Clingers	44	3
	Total Score	**14**
	IBI Score	**2.33**
	Narrative Rating	**Poor**

Table 23
Instream Station IBI Score for the 2017 – 2018 Reporting Year

Metric	Result	Score
Number of Taxa	22	3
Number of EPT	5	3
Number Ephemeroptera	2	3
% Intolerant Urban	18	3
% Chironomidae	49	3
% Clingers	66	3
	Total Score	**18**
	IBI Score	**3**
	Narrative Rating	**Fair**

Figure 22 presents these scores annually from 2001 through 2018. The trends of both stations appear to be correlative throughout this time period. On average, the score for the instream station remains 0.8 greater than that of the outfall station. The average score for the outfall station is 2.2, which is rated as poor biological health according to MBSS guidelines. The average score for the instream station is 3, which is on the boundary between poor and fair biological health according to MBSS guidelines. The outfall reach had a similar score as the previous year; the only metric that changed was the number of taxa, which increased the score from 3 to 5. The instream reach score remained the same as the previous year. While the number of taxa was fewer than the previous year, the % of clingers in the sample increased. Both stations appear to be relatively intolerable for sensitive species, particularly within the outfall reach where no sensitive species were observed.

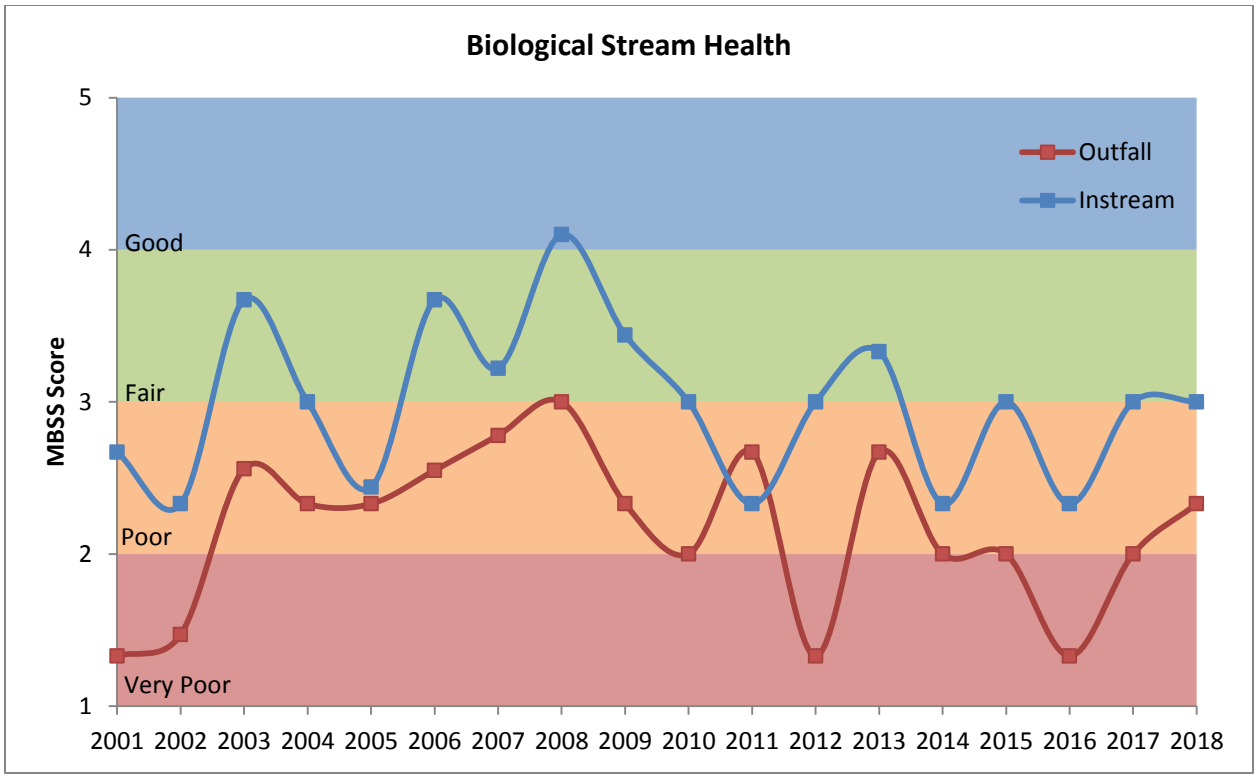


Figure 22: Macro-Invertebrate IBI Analysis 2001 – 2018

The biological habitat assessment results for each station are summarized in **Table 24**. The scores are of a maximum 160 points based on eight parameters as shown in **Table 16**. Overall, the quality of biological habitat at the instream station remains higher than the outfall station with overall habitat scores of 97 and 76, respectively. From 1998 through 2018 (excluding 2001), as shown in **Figure 23**, the stations have average habitat scores of 92 for the instream station and 69 for the outfall station. This was a fairly typical year for both stations; the instream scoring five points higher, but the outfall station scored seven points above average, with considerable improvement in the instream habitat category. The weakest parameters for both stations are riffle/run quality, embeddedness, and shading.

Table 24
Spring 2017 Habitat Assessment Results

Parameter	Outfall	Category	In-stream	Category
Instream Habitat	11	sub-optimal	15	sub-optimal
Epifaunal Substrate	12	sub-optimal	14	sub-optimal
Velocity/Depth Diversity	9	marginal	12	sub-optimal
Pool/Glide/Eddy Quality	8	marginal	9	marginal
Riffle/Run Quality	8	marginal	11	sub-optimal
Embeddedness	6	marginal	10	marginal
Shading	7	marginal	8	marginal
Trash Rating	15	sub-optimal	18	optimal
Total Score (max. of 160)	**76**		**97**	
Score (percent)	**48%**		**61%**	

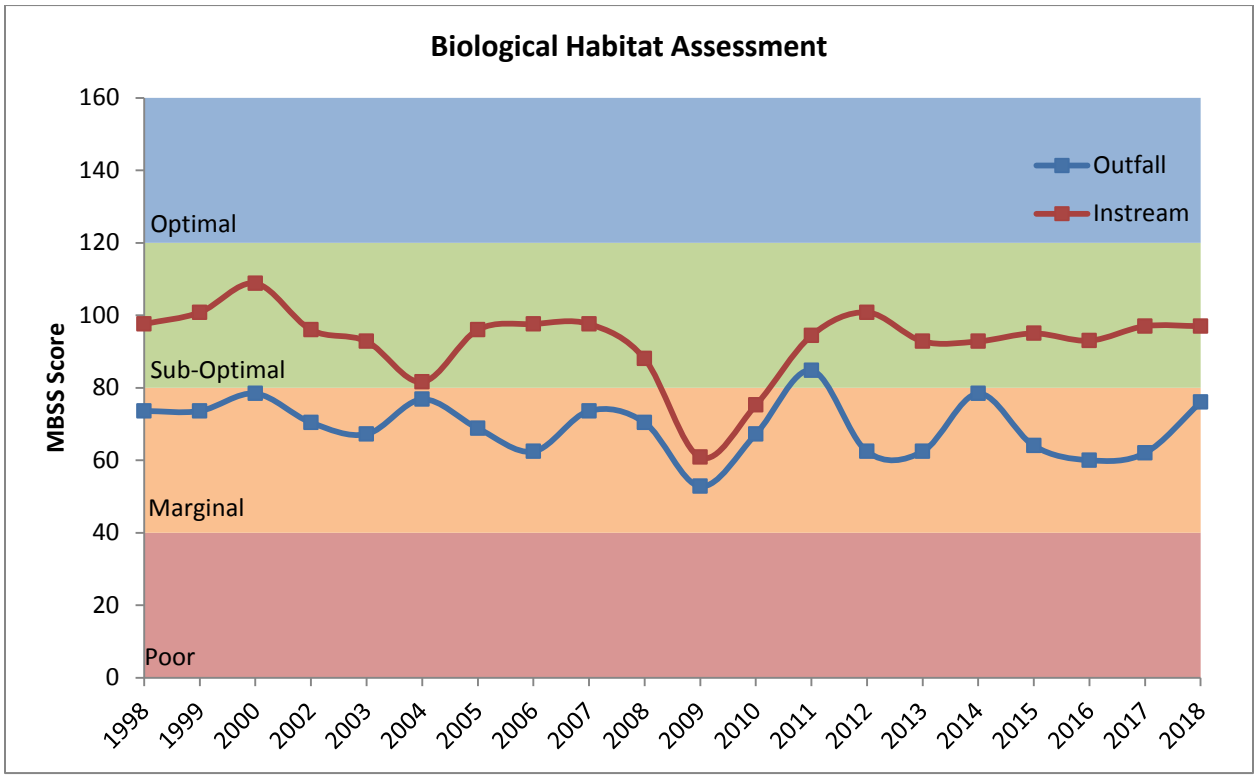


Figure 23: Comparison of NPDES Station Habitat 1998 – 2018 (Excluding 2001)

It should be noted that the habitat assessment is wholly subjective. Slight changes may be a result of inconsistencies in assessor(s) scoring methodology. To show a general relationship between the habitat and biological scores, these have been plotted for the outfall and instream stations in **Figures 24 and 25**, respectively. These are plotted on each assessments overall scoring range. Though not unexpected, it is evident that the lower the quality of habitat in this

case, the lower the biological quality found in said habitat. Both stations appear to have a one to two year period of latency between habitat and biological changes. The certainty of any evident relationship is low given the high degree of bias and chance that is probable in these assessments.

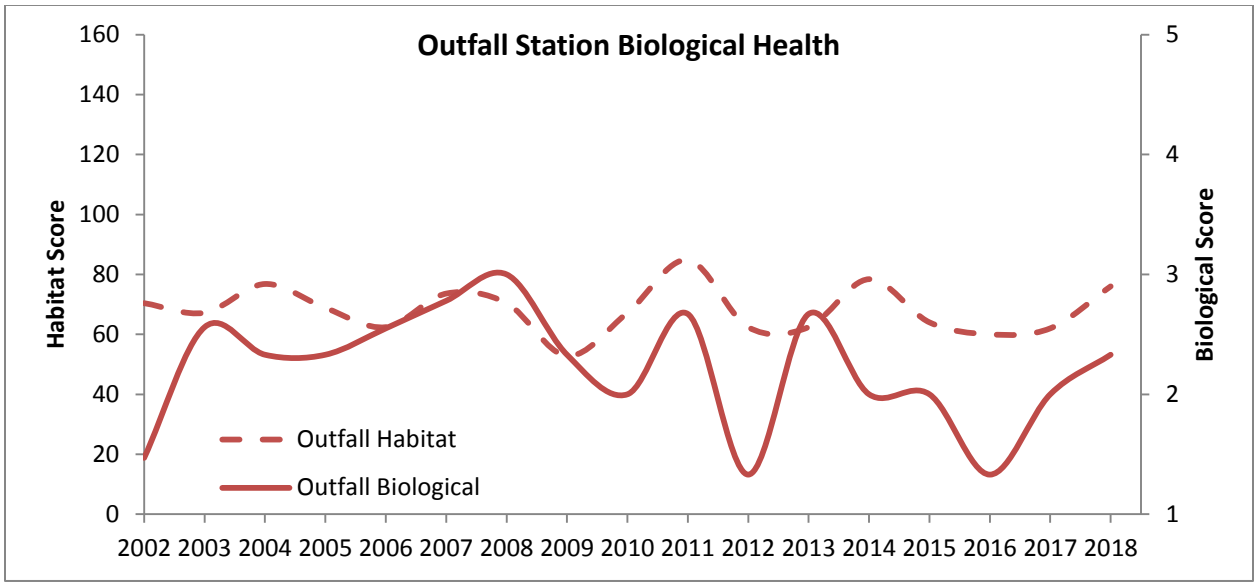


Figure 24: Comparison of Outfall Station Habitat and Biological IBI Scores 2002 – 2018

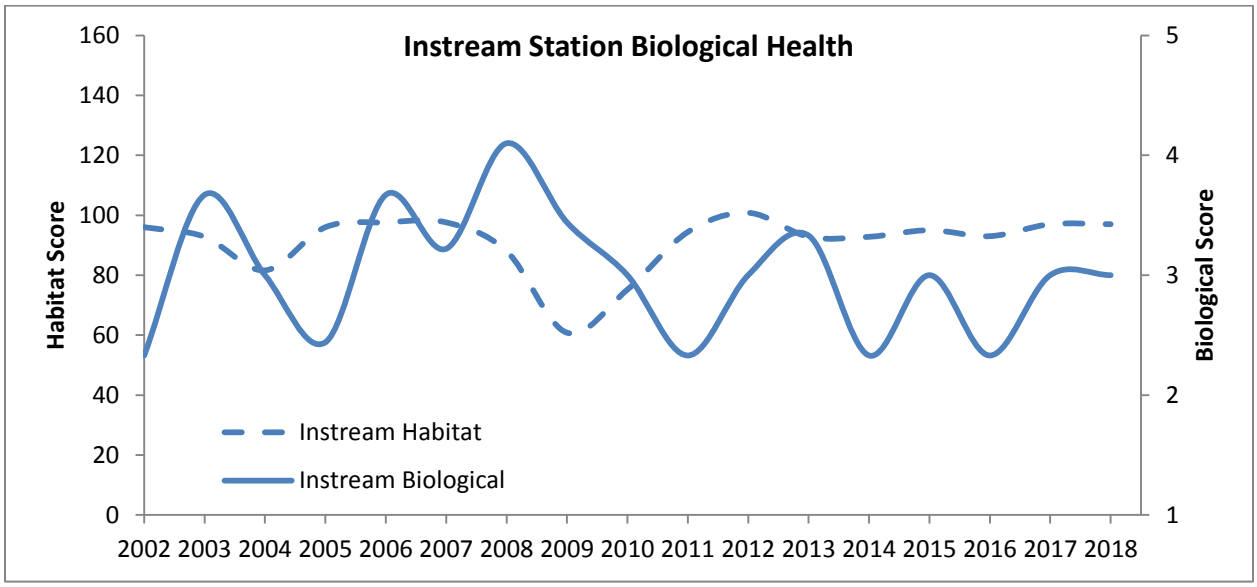


Figure 25: Comparison of Instream Station Habitat and Biological IBI Scores 2002 – 2018

G. Program Funding

1. Operational Expenses

The following information relates to the operating budget expenses to support compliance needs for the County's NPDES MS4 permit requirements. Operating expenditures in this program are principally associated with administration of the permit, monitoring, maintenance of BMP, and other responsibilities associated with the daily operations of the LRM and BRM.

OPERATING PROGRAM ELEMENTS	EXPENDITURES
Administration - Salaries and Benefits	$1,087,431.95
Operation and Maintenance - Mowing, Gasoline, Repairs/Parts	$85,494.57
Public Education and Outreach	$2,939.89
Lab Testing/Supplies, Contract Services, Small Equipment, Conferences	$21,545.22
Debt Service Payment	$1,003,962.69
Total Operating Expenditures for FY 18	**$2,201,374.32**

2. Capital Expenses

A capital budget was established early in the program to support compliance needs for the County's NPDES MS4 permit responsibilities. Capital expenditures in this program are principally associated with the permit's Watershed Assessment and Restoration requirements.

CAPITAL PROGRAMS	EXPENDITURES
Watershed Assessment and Improvement (NPDES)	$1,965,250.84
Environmental Compliance	$11,249.00
Stormwater Facility Renovations	$160,722.20
Total Capital Expenditures for FY 18	**$2,137,222.04**

Cumulative capital expenditures for the program since 2005 can be found in **Table 25**. The approved FY 2019 – 2023 CIP estimates of program funds can be found in **Tables 26, 27, and 28**. It is important to note that the funding beyond FY 2019 is subject to future budget review and approval processes. Therefore, no guarantee is made to future appropriations beyond FY 2019.

Table 25
Total NPDES MS4 Capital Expenditures
Carroll County, Maryland
July 15, 2005 through June 30, 2017

Permit Year	Capital Expenditure
7/15/05 to 6/30/06	$36,040.19
7/1/06 to 6/30/07	$53,593.00
7/1/07 to 6/30/08	$1,978,829.14
7/1/08 to 5/30/09	$816,823.30
7/1/09 to 5/30/10	$1,744,986.91
7/1/10 to 6/30/11	$672,479.04
7/1/10 to 6/30/11	$23,269.00
7/1/11 to 6/30/12	$1,635,671.32
7/1/12 to 6/30/13	$1,012,067.26
7/1/13 to 6/30/14	$2,147,337.51
7/1/14 to 6/30/15	$2,964,442.44
7/1/15 to 6/30/16	$2,297,193.78
7/1/16 to 6/30/17	$4,851,451.61
7/1/17 to 6/30/18	$2,137,222.04
Total permit expenditures, to date	***$22,371,406.54***
Grants received	***$6,093,351.25***
Actual County expenditures	***$16,278,055.29***

Approved Community Investment Plan 2019 – 2024

Table 26
Watershed Assessment and Improvement (NPDES)

	FY 19	FY 20	FY 21	FY 22	FY 23	FY 24	Prior Allocation	Balance to Complete	Total Project Cost
Engineering/Design	115,000	115,000	310,000	180,000	315,000	130,000			**1,165,000**
Land Acquisition									**0**
Site Work									**0**
Construction	3,035,000	3,135,000	3,040,000	3,270,000	3,235,000	3,520,000			**19,235,000**
Equipment/Furnishings									**0**
Other									**0**
EXPENDITURES									
TOTAL	**3,150,000**	**3,250,000**	**3,350,000**	**3,450,000**	**3,550,000**	**3,650,000**	**0**	**0**	**20,400,000**

Table 27
Environmental Compliance

	FY19	FY20	FY21	FY22	FY23	FY24	Prior Allocation	Balance to Complete	Total Project Cost
									0
Engineering/Design									**0**
Land Acquisition									**0**
Site Work									
Construction	75,000	75,000	75,000	75,000	75,000	75,000			**450,000**
Equipment/Furnishings									
Other									
EXPENDITURES									
TOTAL	**75,000**	**75,000**	**75,000**	**75,000**	**75,000**	**75,000**	**0**	**0**	**450,000**

Table 28
Stormwater Facility Renovations

	FY 19	FY 20	FY 21	FY 22	FY 23	FY 24	Prior Allocation	Balance to Complete	Total Project Cost
Engineering/Design	60,000	10,000	30,000	35,000	20,000	50,000			**205,000**
Land Acquisition									**0**
Site Work									**0**
Construction	310,000	300,000	280,000	275,000	290,000	260,000			**1,715,000**
Equipment/Furnishings									**0**
Other									**0**
EXPENDITURES									
TOTAL	**370,000**	**310,000**	**310,000**	**310,000**	**310,000**	**310,000**	**0**	**0**	**1,920,000**

New in 2015, the Stormwater Facility Renovations CIP (**Table 28)** has restored (back to as-built condition) 23 of the 199 existing County owned structural stormwater management facilities. Restoration work has involved removal of woody vegetation, replacement of corrugated metal pipes, repair of eroded areas at the outfall or inflow points of the facility, and removal of accumulated sediment. Another important factor taken into consideration when evaluating the facilities prior to restoration is the accessibility to the facility and ease of maintenance. Priority of projects is based on tri-annual inspection reports and the age of the facility. To date, close to $600,000.00 has been spent on this restoration effort.

Table 29 provides a project list and the status of the individual projects in the approved capital budget for the Stormwater Facility Renovation Program.

Table 29 Stormwater Management Facility Renovation Program 2016-2024		
Year	Project Name	MDE8NAME
Project Completed		
2016	Poole Meadows	Liberty Reservoir
2016	Carroll Highlands	Liberty Reservoir
2016	Grand Valley Farms Sec. 2	Double Pipe Creek
2016	Washington Square	Liberty Reservoir
2016	Oklahoma Phase 1 Pond #2	Liberty Reservoir
2016	Jenna Estates Sec. 2 Ph. 1 Pond 1	S Branch Patapsco
2017	Oklahoma Sweetwater	Liberty Reservoir
2017	Grand View Resub. Lot 38	S Branch Patapsco
2017	Eldersburg Estates Sec. 1	S Branch Patapsco
2017	Sun Valley Waterloo Section	Liberty Reservoir
2017	Carrollyn Manor Section 6	Double Pipe Creek
2017	O'Brecht Estates	S Branch Patapsco
2017	Carmae Acres	S Branch Patapsco
2017	Kalten Acres Sec. 1	Double Pipe Creek
2018	Wilmot Manor	Liberty Reservoir
2018	Matthews Meadows Sec. 2	Liberty Reservoir
2018	Piney Ridge Village 7	South Branch Patapsco
2018	Exceptional Center	Double Pipe Creek
2018	Carroll Woods Est. Sec. 7	Lower Monocacy River
2018	C. C. Commerce Center	Liberty Reservoir
2018	Larash Manor	Liberty Reservoir
2018	Squires Subdivision	Liberty Reservoir
2018	Stafford Estates	Liberty Reservoir
Projects Under Construction		
2019	St. Georges Gate Sec. 2	Liberty Reservoir
2019	Bluebird Hills	Prettyboy Reservoir
2019	Bluebird Hills (plunge pool)	Prettyboy Reservoir
Projects Planned		
2020	Carmae Acres	South Branch Patapsco
2020	North Carroll Library	Prettyboy Reservoir
2020	North Carroll Library	Prettyboy Reservoir
2020	Hunters Crossing #2	South Branch Patapsco
2020	Ronsdale Road	Liberty Reservoir
2020	Northern Landfill	Liberty Reservoir
2020	Hoods Mill Landfill Closure	South Branch Patapsco
2021	Stone Manor Pond 1	Liberty Reservoir
2021	Stone Manor Pond 2	Liberty Reservoir

Projects Planned		
2021	Carrollyn Manor Section 7	Double Pipe Creek
2021	Squire Village	Liberty Reservoir
2021	Ralph Street Extension	Liberty Reservoir
2021	C. C. Assoc. Retarded Citizens	Liberty Reservoir
2021	Carroll Co. Multi. Parking	Liberty Reservoir
2021	Benjamins Claim Condo's	South Branch Patapsco
2021	Benjamins Claim Basin A	South Branch Patapsco
2021	Center Street Road Extension	Liberty Reservoir
2021	Farm Museum Pond	Double Pipe Creek
2021	Sullivan Heights	Liberty Reservoir
2022	Sumners Hollow Pond 1	Liberty Reservoir
2022	Sumners Hollow Pond 2	Liberty Reservoir
2022	Sun Valley Sec. 2	Double Pipe Creek
2022	Johanna's Joy 2	Double Pipe Creek
2022	Meadow Ridge ED Pond 1	Double Pipe Creek
2022	Meadow Ridge ED Pond 2	Double Pipe Creek
2022	Meadow Ridge ED Pond 3	Double Pipe Creek
2022	Cranberry Hill Resub. Lot	Liberty Reservoir
2023	Patapsco Valley Overlook	South Branch Patapsco
2023	Stoffle Park	Liberty Reservoir
2023	Bark Hill Park	Double Pipe Creek
2023	C. C. Regional Airport	Liberty Reservoir
2023	C. C. Regional Airport	Liberty Reservoir
2023	C. C. Regional Airport	Liberty Reservoir
2023	C. C. Regional Airport	Liberty Reservoir
2023	C. C.. Regional Airport	Liberty Reservoir
2023	Edgewood Sec. 7	Liberty Reservoir
2024	Safe Haven	Double Pipe Creek
2024	Fannie Ridge WQ 1	South Branch Patapsco
2024	Tira Estates	Liberty Reservoir
2024	Piney Ridge Village 5/6	South Branch Patapsco
2024	Piney Ridge Village 5/6	South Branch Patapsco
2024	Piney Ridge Village 5/6	South Branch Patapsco
2024	Bradford Knoll	Liberty Reservoir

Part IV. Special Programmatic Conditions

Carroll County actively participates in the Chesapeake Bay TMDL efforts. In addition to attending regional workshops held by MDE, staff also participates in webinars offered by the EPA and MDE regarding the Bay TMDL and Maryland's WIP processes. The WRCC continues to serve as the County's local WIP team, and participates in discussions and development of WIP efforts. The WRCC continues to provide progress updates on the 2-year milestones. County staff completed work with MDE staff to update the historical BMP inventory and provide GIS data needed for land use data to update the CBP model for the 2017 Midpoint Assessment. Staff

continue to participate in review of the land use/land cover data under development by CBP and other agencies.

A brief discussion of clarification is provided related to this permit and "toward meeting the Chesapeake Bay TMDL by 2025." The permittees continue to work toward compliance with the 20 percent restoration requirement as it relates to compliance with the Chesapeake Bay TMDL. It should be noted that there is still no agreement with Maryland's Phase II WIP, State-derived, Carroll County-specific nutrient load numbers. The numbers were calculated based on the Maryland Assessment and Scenario Tool (MAST) model, which, to date, has not clearly identified input parameters nor output values which are transparent or appear technically sound. Therefore, we will continue to support and work toward the clearly definable 20 percent restoration strategy, with any other TMDL endpoint requirements pending sound, quantitative, reasonable science.

Carroll County staff members participate in many inter-jurisdictional efforts related to stormwater management, reservoir protection, water supply management, water reuse, and other water issues. Staff members participate with several groups that address these issues.

County staff participate as members of the Baltimore Metropolitan Council's Reservoir Technical Group, which meets regularly to discuss issues of common concern regarding protection of the watersheds. Staff also has a very close working relationship with the local Soil Conservation District Board (District). County and District staff coordinate efforts on projects as well as provide technical assistance to one another. This has been a very important relationship for Carroll County where projects are located in the urban/rural fringe areas.

Staff has participated in or attended meetings of numerous efforts and work groups regarding various other initiatives, including, but not limited to, updates to stormwater management regulations, water reuse regulation development and update, growth offsets and trading policy and regulations, legislative proposals, discussions related to implementation of permit requirements, and various other initiatives. Participation in regional and statewide management and protection issues will continue to be a priority for Carroll County.

The County and municipalities adopted a comprehensive Water Resources Element (WRE) in April 2010, after a very thorough study of water supply, wastewater, and water quality issues in Carroll County and extensive coordination and collaboration with MDE staff. The WRE provides long-term direction to the County and municipalities regarding public water supply needs and issues and limitations related to wastewater treatment.

Appendix A

Organizational Chart:
Department of Land and Resource Management

Appendix A

Carroll County Board of Commissioners

Land & Resource Management - Director

- Administrative Assistant
- NPDES Specialist (2)
- Hydrogeologist
- Special Projects Coordinator
- GIS Analyst III
  - GIS Analyst II
  - GIS Analyst I

AGRICULTURAL LAND PRESERVATION

Manager
- Preservation Specialist
- Office Technician

MOA 10/23/14
Town of Hampstead
Town of Manchester
Town of Mount Airy
Town of New Windsor
Town of Sykesville
City of Taneytown
Town of Union Bridge
City of Westminster

BUREAU OF RESOURCE MANAGEMENT

Bureau Chief
- Office Technician
- Office Associate
- Forest Conservation Specialist
- Floodplain Mgmt/GIS Specialist
- SWM Program Engineer
- SWM Review Assistant
- Watershed Restoration Engineer
- Watershed Mgmt. Coordinator
- Watershed Grants Analyst
- **Water Resource Supervisor**
  - Water Resource Specialist (2)
  - Water Resource Technician (1)
- **Chief, Environmental Inspection Services Division**
  - Inspector (4)

BUREAU OF DEVELOPMENT REVIEW

Bureau Chief
- Office Technician
- Plans Reviewer-Engineering
- Development Review Coordinator III
- Development Review Coordinator I
- Development Review Coordinator I
- Legal Document Technician
- Development Review Technician

ZONING ADMINISTRATION

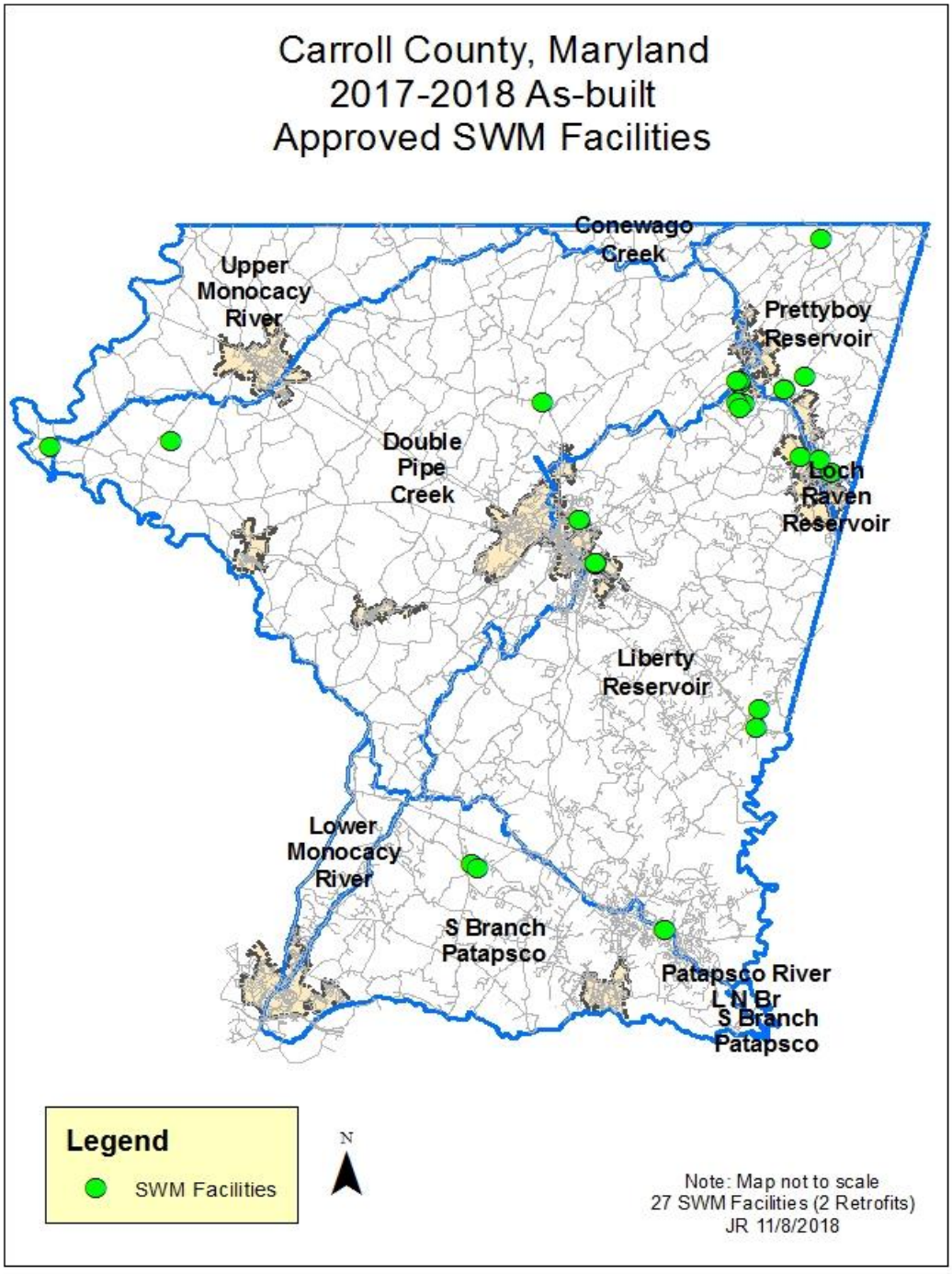
Zoning Administrator
- Administrative Assistant
- Zoning Technician
- Zoning Inspector

Appendix B

County NPDES MS4 Database CD

(Available Upon Request)

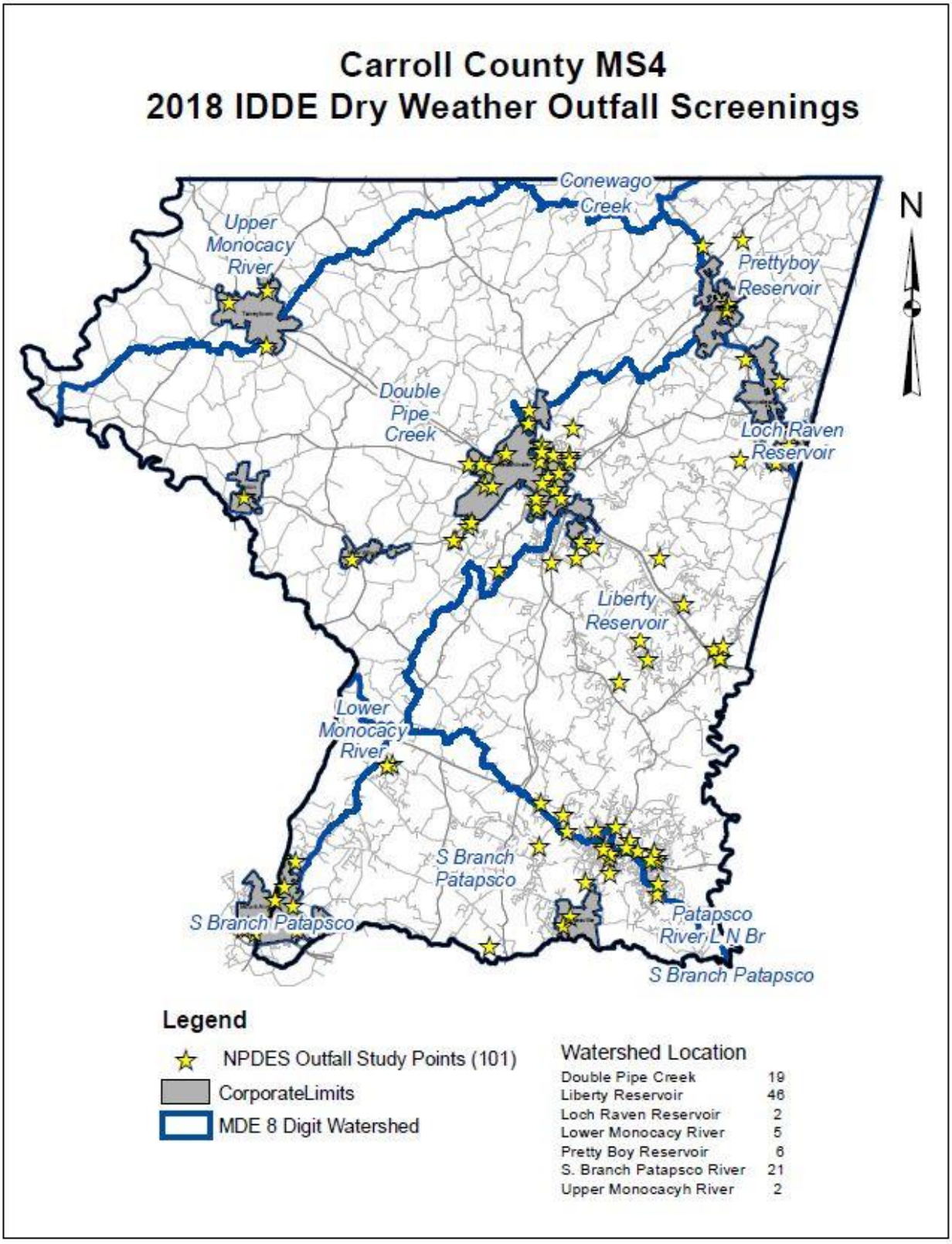
Carroll County, Maryland, 2017-2018 As-built Approved SWM Facilities Map


Carroll County, Maryland
2017-2018 As-built
Approved SWM Facilities
Conewago Creek
Upper Monocacy River
Prettyboy Reservoir
Double Pipe Creek
Loch Raven Reservoir
Liberty Reservoir
Lower Monocacy River
S Branch Patapsco
Patapsco River L N Br
S Branch Patapsco
Legend
SWM Facilities
N
Note: Map not to scale
27 SWM Facilities (2 Retrofits)
JR 11/8/2018

Appendix C

Illicit Discharge Detection and Elimination (IDDE)

- Carroll County MS4 2018 IDDE Outfall Screenings (Map)
- 2018 Illicit Discharge Summary, Illicit Discharge Complaints
- 2018 IDDE Commercial/Industrial Visual Survey Locations (Map)
- 2018 Visual Survey Summary
- Visual Survey Form
- MDE IDDE Audit Letter


Carroll County MS4
2018 IDDE Dry Weather Outfall Screenings
Conewago Creek
Upper Monocacy River
Prettyboy Reservoir
Double Pipe Creek
Loch Raven Reservoir
Liberty Reservoir
Lower Monocacy River
S Branch Patapsco
S Branch Patapsco
Patapsco River L N Br
S Branch Patapsco
N
Legend
NPDES Outfall Study Points (101)
CorporateLimits
MDE 8 Digit Watershed
Watershed Location
Double Pipe Creek 19
Liberty Reservoir 46
Loch Raven Reservoir 2
Lower Monocacy River 5
Pretty Boy Reservoir 6
S. Branch Patapsco River 21
Upper Monocacyh River 2

Appendix C

IDDE Program

2018 Illicit Discharge Summary

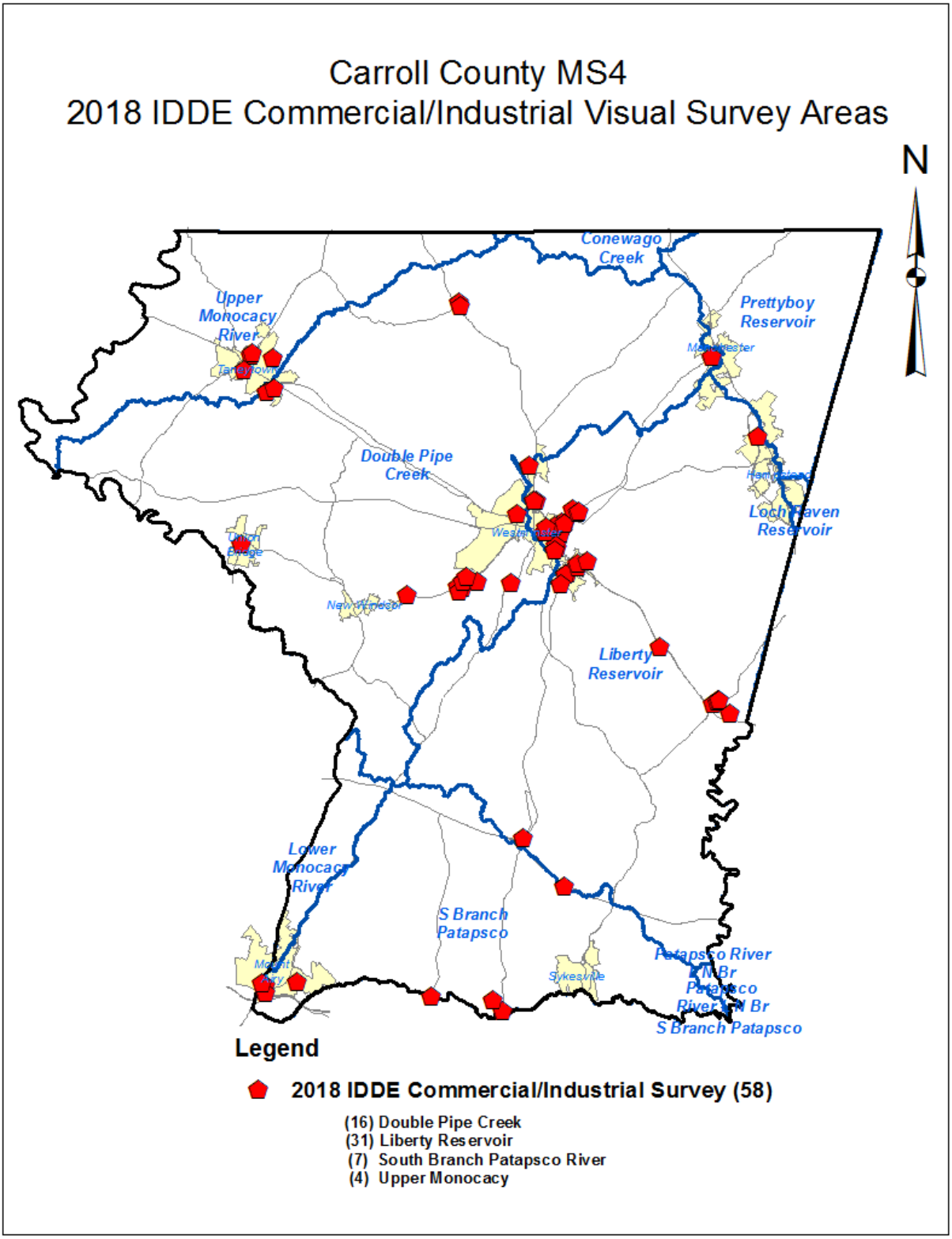
*Illicit Discharge Complaints Processed from July 1, 2017 – June 30, 2018**

Case No.	Complaint/ Date	Action Taken	Status	Jurisdiction/ Location
PD-17-0007 *(This is a 2017 permit period incident not shown in previous annual report table due to an errant data software query and tabled here for the record)	City of Westminster reported restaurant grease trap overflow discharge to street. Reported: 05/10/17	City DPW Streets Department responded to business owner's call with significant spill containment and clean-up on street preventing discharge to storm drain inlet. Business addressed its on-site clean-up and cause of spill for future prevention action.	Illicit Discharge Eliminated 05/10/17 Case Closed: 05/16/17	Winters Street Westminster, MD
PD-17-0008	County Roads reported a possible illicit grey water connection to storm drain inlet. Reported: 08/02/17	County DLRM / Resource Management and CC Health Department (HD) investigated and determined a rain spout and sump pump connection to storm drain system. HD personnel inspected sump pump system with owner and determine no grey water connection and only foundation water discharged, an exempt discharge.	Non-Illicit Discharge Case Closed: 10/03/16	Conover Road Harney, MD
PD-17-0009	HOA reported to Town of Hampstead expanding oil stains from multiple parked vehicles with no tags in the path of stormwater run-on toward stormwater facility parcel. Reported: 09/27/2017	County DLRM and Town DPW staff investigated. Town contacted local law enforcement regarding untagged vehicle codes for review. County EISD staff sent notification letter and spoke with owner requiring dry clean up measures w/multiple follow ups. Site cleaned up.	Illicit Discharge Eliminated Case Closed: 12/29/2017	Woodsman Drive Hampstead, MD
PD-17-0010	County DLRM staff encountered concrete washout in progress by contractor on street. Reported: 10/03/2017	County DLRM staff stopped and instructed contractor to clean residual material from street for proper disposal. Follow-up notification letter sent to contractor w/BMP materials w/copy to Town of New Windsor.	Illicit Discharge Eliminated Case Closed: 10/30/2017	Church Street New Windsor, MD
PD-17-0011	County Roads reported possible gray water discharge from sump pump into County road/ditch. Reported: 9/28/2017	County DLRM staff investigated. Discharge at time was clear and did not show signs of grey water or suds. Site will be generally monitored by multiple agencies on an on-going basis.	Non-Illicit Discharge Case Closed: 10/03/2017	Main Road, Union Bridge, MD

Case No.	Complaint/ Date	Action Taken	Status	Jurisdiction/ Location
PD-17-0012	Citizen reported leaking fuel and odor from a fuel tank stored at neighbor's property. Reported: 10/10/2017	County EISD staff investigated and determined fuel tank empty, not in use, properly sealed and no odor. Unrelated, investigator observed significant grading by owner w/equipment at rear of property which may account for fuel smell. Investigator cited the owner for not having proper grading permit and processed through Erosion and Sediment Control regulations.	Non-Illicit Discharge Case Closed: 10/23/2017	Old Washington Road, Sykesville, MD
PD-17-0013	Citizen reported wastewater discharge from restaurant to public thoroughfare draining to storm drain inlet. Traffic tracking material into other areas. Reported: 10/20/2017	City Westminster Code Enforcement Officer and County DLRM staff investigated spoke w/management and staff. Notification letter and BMP information sent by City to restaurant.	Illicit Discharge Eliminated Case Closed: 10/30/2017	Englar Road, Westminster, MD
PD-17-0014	Citizen complaint reported to MDE regarding sump pump discharge pollutants coming from neighbor and being pumped into complainant's basement. MDE contacted Town of Manchester requesting MS4 investigation. Reported: 11/02/2017	Town of Manchester and County DLRM staff investigated. No contaminants in sump pump foundation water. Close proximity between houses and old sidewalk may cause drainage issues. Town advised complainant to contact County plumbing inspector to ensure plumbing codes are being met.	Non-Illicit Discharge Case Closed: 11/08/2017	Main Street, Manchester, MD
PD-17-0015	Citizen reported concrete truck washout near storm drain and stream near water resource protection area. Reported: 11/09/2017	County EISD staff investigated and found discharge area but did not find discharge area reached inlet or stream. Required home builder to clean up residual material, follow BMPs for on site management. Informed builder would be responsible and cited for any further on-site violation by his concrete hauler. Clean up confirmed.	Illicit Discharge Eliminated Case Closed: 11/14/2017	Krom's Drive Manchester, MD
PD-17-0016	County staff reported restaurant washing equipment outside draining across thoroughfare to private storm drain inlet that connects to MDSHA inlet under MD140. Reported: 11/22/2017	County EISD staff investigated and issued notification letter with restaurant BMP educational material. On-going monitoring to continue for site. Future wastewater discharges observed to be reported to Carroll County Health Department.	Illicit Discharge Eliminated Case Closed: 12/08/2017	Baltimore Blvd, Westminster, MD

Case No.	Complaint/ Date	Action Taken	Status	Jurisdiction/ Location
PD-17-0017	Citizen reported furniture and TV dumped off bridge into stream. Reported: 12/12/2017	County EISD coordinated with County Roads for removal. Completed.	Illicit Discharge Eliminated Case Closed: 12/22/2017	Arters Mill Road Westminster, MD
PD-17-0018	Citizen reported to County Roads plumbing materials dumped in stream. Unable to reach due to fence. Reported: 12/06/2017	County DLRM staff investigated, removed and properly disposed of old sump pump, plumbing glue, trash bag of materials, gloves, etc. Spoke w/citizen who reported the dumped materials but no leads.	Illicit Discharge Eliminated Case Closed: 12/18/2017	Linton Road, Sykesville, MD
PD-17-0019	Citizen reported to City of Taneytown a landscape company/ contractor blowing leaves into storm drain system connected to MS4 at retail store parking lot. Reported: 11/28/2017	City sent notification letter to contractor w/copy to retail store to immediately stop practice and held responsible for potential clogging issues. MS4 educational and leaf management BMP fact sheet for proper disposal included. Retail store employees notified in person.	Illicit Discharge Eliminated Case Closed: 01/10/2018	Breakiron Street Taneytown, MD
PD-18-0001	Citizen reported residential contractor painting home getting paint on ground that is washing to storm drain inlet. Reported: 01/12/2018	County EISD investigator spoke with contractor regarding proper good housekeeping practices; paint and paintbrush washing disposal to sanitary in home, and latex residuals in trash for landfill.	Illicit Discharge Eliminated Case Closed: 01/17/2018	Sunshine Way, Westminster, MD
PD-18-0002	City of Westminster reported oil sheen on stream surface near with oil like odor utility work. Reported: 03/01/2018	County DLRM investigated and found no petroleum, but naturally occurring bacteria (iron floc) from groundwater sources which has oil like sheen appearance on surface water. Odor from excavating diesel equipment.	Non-Illicit Discharge Case Closed: 03/05/2018	Poole Road Open Space Utility R/W Westminster, MD
PD-18-0003	Citizen reported auto fluid leaking from pickup truck parked at various locations on street. Reported: 03/26/2018	County DLRM investigated and confirmed vehicle leaking auto fluids. Notification and Homeowner BMPs sent to owner. Follow up visit found vehicle not leaking.	Illicit Discharge Eliminated Case Closed: 04/09/2018	Piney Ridge Drive, Sykesville, MD
PD-18-0004	County staff reported auto fluid like deposits at storm drain outfall dry SWM facility entry point. Reported: 04/05/2018	County DLRM/EISD staff investigated and met with owner on-site with cleanup instructions. Cleanup completed. Outfall rechecked and o.k. Source apparent from street.	Illicit Discharge Eliminated Case Closed: 05/11/2018	New Expansion Drive, Sykesville, MD
PD-18-0005	Citizen reported to City of Taneytown auto fluid leaking from pickup truck on street near inlet. Reported: 05/15/2018	City of Taneytown located owner and sent notification letter for vehicle repair or removal and dry cleanup instructions. Follow up visit found vehicle removed and site o.k.	Illicit Discharge Eliminated Case Closed: 08/30/2018	Bentley Drive, Taneytown, MD

Case No.	Complaint/ Date	Action Taken	Status	Jurisdiction/ Location
PD-18-0006	Citizen reported to Town of Manchester dead and yellowing grass and plant material on site and neighboring lower lawns below commercial transport gravel lot where pile of white granular material visible and not covered. Reported: 06/20/2018	Town of Manchester investigated. Contacted Fire Department, Hazmat, and police for investigation. Hazmat identified material as Boric acid often used to soften cement in transport tankers. Hazmat contacted MDE Hotline with instructions for owner clean-up and disposal. Cleanup confirmed by Town. Town of Manchester coordinated w/County DLRM and MDE Industrial Permit Compliance. MDE 12SW enforcement action taken. CC Health Department contacted regarding neighboring well status. MDE municipal well rep. contacted regarding Town well supply monitoring. County Water Resource Manager and County Hydrologist contacted regarding monitoring of water resources as discussed with MDE Compliance representative. EPA contacted Town of Manchester for status 6/27/2018.	Illicit Discharge Eliminated Case Open: In Progress as of 06/30/2018 Multi-Agency Monitoring and MDE Compliance Enforcement Action	Hanover Pike, Manchester, MD


Carroll County MS4
2018 IDDE Commercial/Industrial Visual Survey Areas
N
Conewago Creek
Upper Monocacy River
Prettyboy Reservoir
Double Pipe Creek
Loch Raven Reservoir
Liberty Reservoir
Lower Monocacy River
S Branch Patapsco
Patapsco River
S Branch Patapsco
Legend
2018 IDDE Commercial/Industrial Survey (58)
(16) Double Pipe Creek
(31) Liberty Reservoir
(7) South Branch Patapsco River
(4) Upper Monocacy

Appendix C
IDDE Program
2018 Commercial Industrial Visual Survey Summary
Visual Survey Areas Requiring Follow-up Actions
Processed from July 1, 2017 – June 30, 2018.

This table presents the 8 of 58 Commercial/Industrial Visual Surveys recommended for follow-up.
No Illicit Discharges Observed

Unique ID#	Visual Survey # Date	Land Use	Activity Location/ Watershed	Potential Significant Pollutant Source	Follow-Up Action/Status
0707043171	VS-18-0024 01/03/18	I	New Windsor Rd Westminster, MD / Double Pipe Creek	Wood Products Manufacturer Loading and Unloading Areas. AST. Solid Waste Mgmt.	Provide Stormwater Pollution Prevention Awareness / General Business BMP Good Housekeeping letter and brochure.
0707052383	VS-18-0026 11/29/17	C	Baltimore Blvd Westminster, MD / Liberty Reservoir	Retail Grocery Store Loading and Unloading, Dumpsters. Solid/Liquid Waste Mgmt.	Met w/store manager. Discussed and provided Stormwater Pollution Prevention Awareness / General Business and Food Service Industry BMP Good Housekeeping brochures.
0707062869	VS-18-0028 02/26/18	C	Greenwood Ave Westminster, MD / Liberty Reservoir	Auto Body Shop and Storage Building. Outdoor Storage. Dumpster Management.	Provide Stormwater Pollution Prevention Awareness / General Business and Auto Industry BMP Good Housekeeping letter and brochure.
0707086555	VS-18-0031 01/03/18	I	Avondale Rd New Windsor, MD / Double Pipe Creek	Food Industry Distributor Loading and Unloading Area & Transportation Parking Near Inlets.	Provide Stormwater Pollution Prevention Awareness / General Business BMP Good Housekeeping letter and brochure.
0713034117	VS-18-0047 06/19/18	C	East Ridgeville Blvd Mount Airy, MD / South Branch Patapsco River	Retail Store Parking Lot Salt Pile Management	Provide Stormwater Pollution Prevention Awareness / General Business BMP Good Housekeeping and Salt Pile Management letter and brochure.
0714055096	VS-18-0053 04/05/18	C	Wedekind Dr Woodbine, MD / South Branch Patapsco River	Multi Business Activities Industrial Buildings & Warehouses. Loading and Unloading & Heavy Equipment.	Provide Stormwater Pollution Prevention Awareness / General Business BMP Good Housekeeping letter and brochure.
0707390065	VS-18-0055 04/12/18	C	Englar Rd Westminster, MD / Liberty Reservoir	Retail Food Store Dumpster Management	Provide Stormwater Pollution Prevention Awareness / General Business BMP Good Housekeeping letter and brochure.
0707129688	VS-18-0056 02/26/18	C	Poole Rd Westminster, MD / Liberty Reservoir	Multi Office Complex Dumpster Management.	Provide Stormwater Pollution Prevention Awareness / General Business BMP Good Housekeeping letter and brochure.

Appendix C

(EXAMPLE)

Carroll County Routine Visual Survey Form
Commercial/Industrial Areas

Unique Site ID #: 0707025157		VS#: 17-0033	(ex. VS-15-0001)
Field Survey Date: 1/26/17		Time: 1:55pm	
Survey Staff Name(s): GLENN E., JOE R.		Election District: 7	
Nearest Receiving Tributary: UNNAMED TO BEAVER RUN		Watershed: LIBERTY RES.	
Northing:	Easting:	Jurisdiction: ✓ County ___ Municipal:	
Business Name: GOODYEAR RETREAD		Street Address: 915 BALTIMORE BLVD 21157	
Business Contact: PLANT & TIRE		Title:	Phone:

Commercial/Industrial Land Use Information

Category: ☐ Commercial ☒ Industrial

Basic Description of Operation: TIRE RETREAD PLANT + COMMERCIAL SALES + SERVICE

Observations: Significant pollutant source present that could be exposed to stormwater: (check all that apply)

Activity	Y/N	Poor Housekeeping (Liquids)	Poor Housekeeping (Solids)	Pollutant Discharge near or MS4 storm drain inlet or waterway (1)	Description (1)
Vehicle Operations (Maintenance & Repair, Fueling, Washing, Storage)	Y				
Loading/Unloading Areas & Paved Surfaces	Y				
Waste Management (Dumpster Condition and Location)	Y				
Outdoor Material Storage	Y		?		OUTDOOR TIRE STORAGE NOT NEAR SD/WATERWAY

(1) Note any unusual physical indicators such as oil sheen, grease, turbidity, visible foam, floating solids, color , odors at discharge points or waterways if observable.

Photo # _____

Photo # _____

Sketch:

Site Potential for Pollutant Source? ✓ Yes ___ No

Comment: SEND BUSINESS PAMPHLET W/ BMPS.

Follow-up Action:

☐ N/A ☑ MS4 Stormwater Pollution Prevention Education

☐ Recommend removal from survey list / no or low potential pollutant source

10/08/2015

CHAPTER 53: ENVIRONMENTAL MANAGEMENT OF STORM SEWER

DEFINITIONS:

POLLUTANT.
(1) A contaminant that may result in any alteration of the physical, chemical, or biological properties of groundwater or surface water, including any change in temperature, taste, color, turbidity, or odor of the receiving waters or discharge or deposit of any organic matter, harmful organism, or liquid, gaseous, solid, radioactive, or other substance into groundwater or surface water that may render the waters harmful, or detrimental to the public health or welfare, to any domestic, commercial, industrial, agricultural, recreational, or other legitimate beneficial use of the water, to any livestock, wild animals, birds, fish, or other aquatic species that may use the water; or

(2) Any substance that may cause or contribute to pollution, including but not limited to paints, varnishes, and solvents; oil and other automotive fluids; non-hazardous liquid and solid wastes and yard wastes; refuse, rubbish, garbage, litter, or other discarded or abandoned objects, ordnances, and accumulations, so that same may cause or contribute to pollution; floatables; pesticides, herbicides, and fertilizers; hazardous substances and wastes; sewage, fecal coliform and pathogens; dissolved and particulate metals; animal wastes; wastes and residues that result from constructing a building or structure; and noxious or offensive matter of any kind.

SIGNIFICANT MATERIALS. Includes but is not limited to: raw materials, petroleum derivative products; any controlled hazardous substances pursuant to COMAR 26.13; industrial waste pursuant to COMAR 26.08.01.01; infectious waste pursuant to COMAR 26.04.07.02; materials such as solvents or detergents; finished materials such as metallic products; raw materials used in food processing or production; fertilizers; pesticides; waste products such as ashes, slag, and sludge, or any other material that could result in pollution of waters of the state as a constituent in stormwater discharge.

Maryland
Department of
the Environment

Larry Hogan, Governor
Boyd K. Rutherford, Lt. Governor

Ben Grumbles, Secretary
Horacio Tablada, Deputy Secretary

February 12, 2018

Mr. Tom Devilbiss, Director
Department of Land and Resource Management
Carroll County Government
225 North Center Street
Westminster MD 21157-5194

Dear Mr. Devilbiss:

The Maryland Department of the Environment, Water and Science Administration (the Department) has completed a review of Carroll County's (the County) illicit discharge detection and elimination (IDDE) program required in PART IV.D.3 of the County's National Pollutant Discharge Elimination System (NPDES) municipal separate storm sewer system (MS4) permit (11-DP-3319, MD0068331). As part of this evaluation, the Department met with County staff on November 29, 2017. The meeting included an in-office presentation and discussion on program implementation. A field review was also conducted that involved the County demonstrating the outfall screening process and visual surveys of two commercial areas. The Department wishes to thank you and your staff for your assistance during the review process.

The Department's evaluation of the County's IDDE program included an assessment of the storm drain system mapping, outfall screening prioritization and procedures, commercial and industrial visual survey procedures, enforcement activities, citizen outreach, and response to complaints. A summary of findings and recommendations is as follows.

1. **Storm Drain System Mapping.** The County hired a geographic information system (GIS) specialist and is working on improving the accuracy of the GIS map of the storm drain system. As part of this effort, the County reviewed all as-built drawings to verify stormwater best management practices and conveyances. The County also verified drainage areas and impervious areas and is currently in the process of scanning mylar drawings of older infrastructure onto its GIS platform. Through a Memorandum of Agreement, the County has taken responsibility for mapping the storm drain systems of eight incorporated municipalities. These are updated once a year to account for new development.

   Field verification is completed by Environmental Inspection Services Division (EISD) staff and NPDES Compliance Specialists during stormwater facility inspections that include outfalls and pipes. The Department of Land and Resource Management coordinates with the Department of Public Works for field verification when necessary. While currently using hard copy maps in the field, the County plans to switch to electronic maps. In the County's efforts to transition to the MS4 geodatabase, data (e.g., outfall dimensions, material) are being refined. The Department has determined that the County is making acceptable progress toward completing its storm drain system map and commends the County for investing resources into this effort. The Department requests that the County report on progress in future annual reports.

1800 Washington Boulevard | Baltimore, MD 21230 | 1-800-633-6101 | 410-537-3000 | TTY Users 1-800-735-2258
www.mde.maryland.gov

2. **Outfall Screening.** The County has identified more than 300 "NPDES Study Points" that include all major outfalls and some outfalls designated as having a high potential for pollution. Outfalls are screened on a triennial basis and include those in the incorporated municipalities. The County has developed a standard operating procedures manual for outfall screenings and investigations, and staff undergo annual training. Procedures detailing data collection and management using the new MS4 geodatabase were also developed. The County's procedures provide essential information on the implementation of an IDDE program and the Department recommends continued implementation of those procedures.

   Outfall screenings in the County and the municipalities are conducted by EISD staff and NPDES Compliance Specialists, respectively. Within 24 hours of discovering any suspected illicit discharge, NPDES Compliance Specialists conduct chemical testing and based on the results, initiate an investigation when necessary. County staff conducted an outfall screening and associated chemical testing on the day of the Department's review. Outfall screening procedures were appropriately followed and the inspection was documented.

   The County and the Department discussed major outfalls that are consistently inundated with groundwater and are not connected to developed areas. These outfalls are on the County's inspection schedule. To comply with PART IV.D.3.1, the groundwater flows are chemically tested each time the outfalls are inspected, but the results are consistently within acceptable chemical parameters. The County suggested establishing a baseline to document consistent groundwater flows to consider making chemical testing optional unless other indicators suggest an illicit discharge is present. As discussed in the meeting, the County can propose a revision of procedures for the Department's review and approval.

3. **Visual Surveys of Commercial and Industrial Areas.** The County's criteria for including commercial/industrial areas in the survey schedule are properties that are one acre or more and within 300 feet of a stream. In the 2017 annual report, the County documented that 60 visual surveys were conducted. Of those, no illicit discharges were discovered and the County provided educational good housekeeping information to four sites. Commercial and industrial surveys are an essential component of the IDDE program because they provide the opportunity to discover pollution closer to the source. These surveys can be more effective in eliminating pollution than dry weather screenings at major outfalls at the end of a large system.

   The Department requests that the County evaluate whether expanding the current survey area will add properties that have a high potential to pollute. For example, large restaurant operations may not be within 300 feet of a stream but are still of concern to the storm sewer system when fats, oils, and grease are not properly discarded.

   The County developed an inspection form for conducting visual surveys. It is currently being field tested and will be revised if field experiences demonstrate changes are needed. The Department requests that in the next annual report, the County provide an update on the use of the inspection form and submit an example.

4. **Program Implementation and Enforcement.** The County responds to hotline complaints within 24 hours and tracks complaints with an Accela database. Each incident remains open until

resolved. The day of review, the County provided a list of illicit discharge complaints and resolutions for 2017. The documentation demonstrates appropriate actions taken by the County to respond to citizen complaints and resolve illicit discharges.

The County's enforcement is authorized in Chapter 53 of Carroll County's ordinance: Environmental Management of Storm Sewer Systems. The County's use of progressive enforcement is a letter, a notice of violation (NOV), and billing the property owner for any repairs that the County made due to lack of compliance. The County allows 30 days for correction, and seven days for more serious violations. The County reports that most violations are resolved voluntarily. On the day of review, the County provided examples of enforcement and educational letters sent to businesses and residents when violations or potential violations were observed. The enforcement letters demonstrate appropriate formal correspondence for resolving instances of stormwater pollution.

5. **Education and Outreach.** The County has engaged in numerous public outreach and education initiatives related to illicit discharge prevention and elimination. The County developed educational brochures targeting specific industries, including automobile related businesses and the restaurant and food service industry. The County has also engaged the local business community to voluntarily pledge to prevent pollution and improve water quality stewardship. The County has hosted public workshops on stormwater pollution prevention for citizens and the business community. The County conducts annual training on stormwater pollution prevention for County and municipal staff. The County is continuously proactive in identifying new training opportunities to stay informed and improve staff performance. The County should continue to report these activities in annual reports.

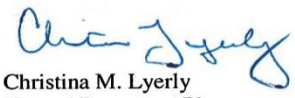
6. **Partnerships with Municipalities.** The County has a Memorandum of Agreement to implement the IDDE program with the eight incorporated municipalities that are co-permittees with the County. The County reported that communication is effective and the municipalities participate in inspections and outreach activities. The County provides technical assistance when needed to all municipalities. The County has sole enforcement authority in four municipalities and joint authority in the remaining four. The County must continue to annually report the activities undertaken to implement minimum control measures for the municipalities.

The Department has determined that the County's program is in compliance with PART IV.D.3, Illicit Discharge Detection and Elimination, of the County's NPDES MS4 permit. In summary, the Department requests that the following be addressed in the next annual report:

- Provide a progress update on the County's efforts to refine the map of the storm drain system
- Evaluate whether expanding the surveyed commercial and industrial areas would add potential significant polluters to the County's inventory
- Provide an update on the use of the visual survey inspection form and submit an example
- Continue to annually report training activities, education initiatives, and collaboration with the incorporated municipalities
- Continue to implement the standard operating procedures and report updates when applicable

The Department recognizes the substantial effort required to implement the illicit discharge detection and elimination program. This effort is essential in our mutual quest to protect local streams and the Chesapeake Bay. The Department commends Carroll County for its commitment to implement a successful program. If you have any questions regarding this review, please contact me at 410-537-3546, christina.lyerly@maryland.gov or Ray Bahr at 410-537-3545, raymond.bahr@maryland.gov.

Sincerely,



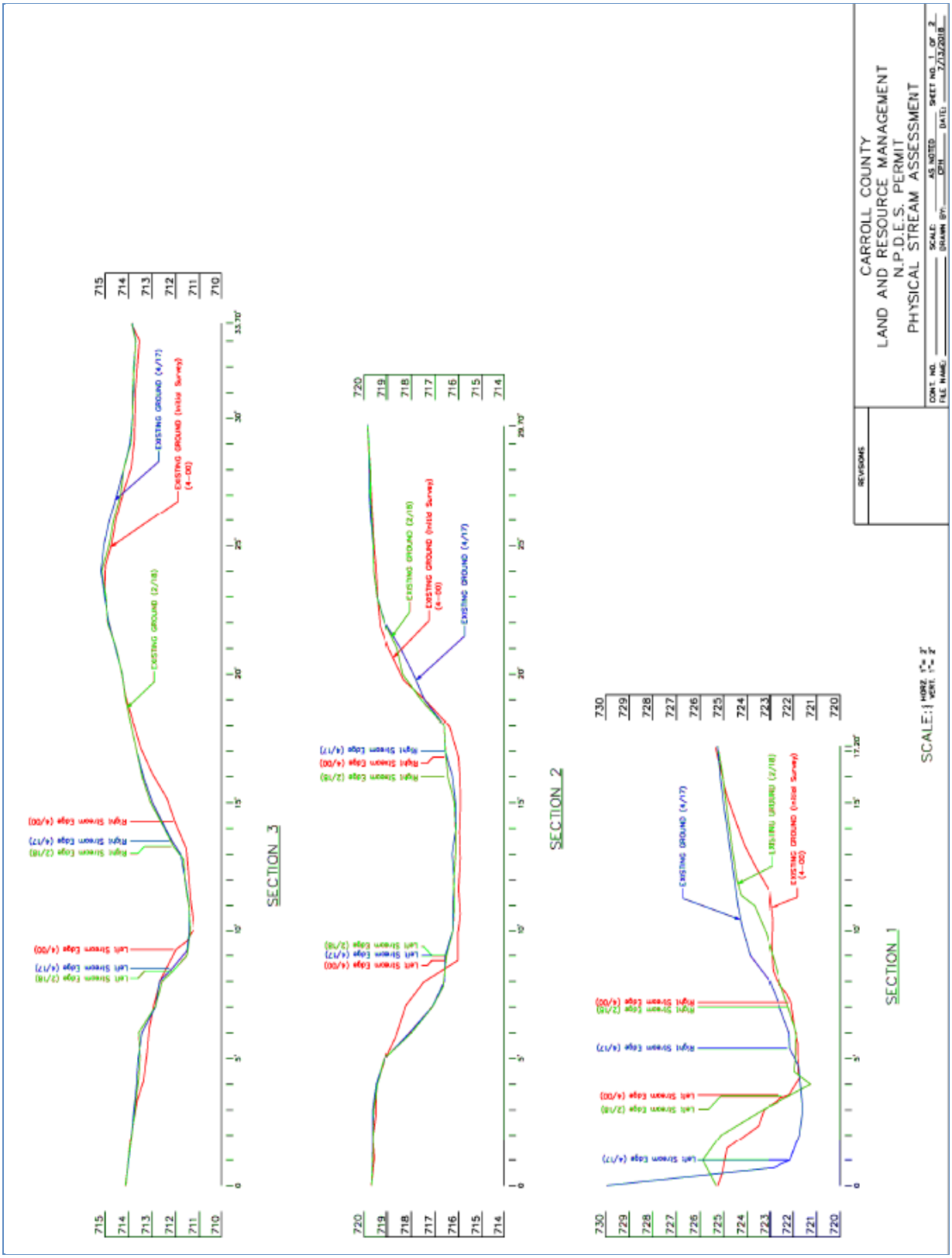
Christina M. Lyerly
Natural Resources Planner
Sediment, Stormwater, and Dam Safety Program

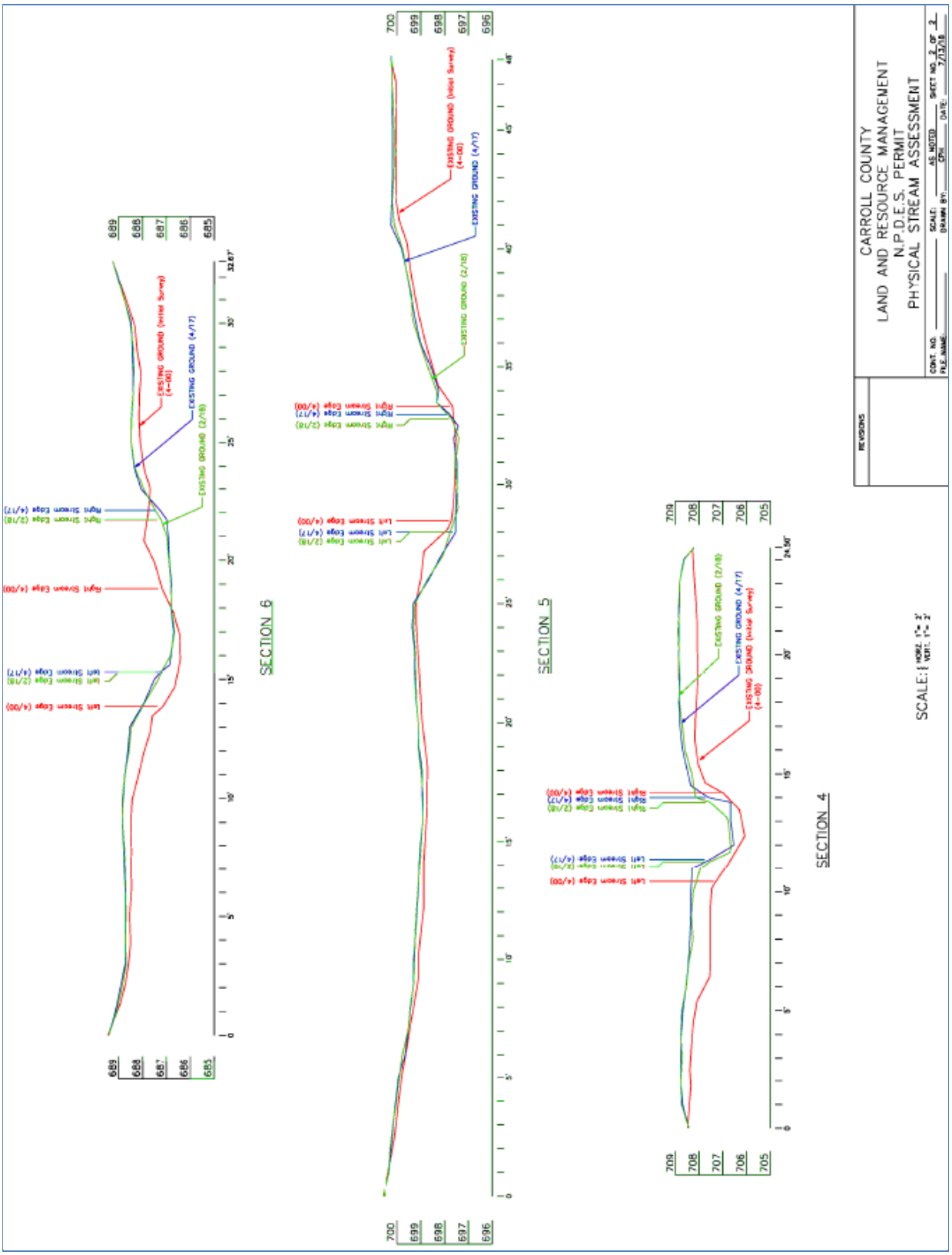
cc: Gale Engles, Carroll County Government
Glenn Edwards, Carroll County Government
Mary Dela Dewa, Maryland Department of the Environment

Appendix D

Monumented Cross Sections

- **Physical Stream Assessment, Sections 1-6 (graphs)**


CARROLL COUNTY
LAND AND RESOURCE MANAGEMENT
N.P.D.E.S. PERMIT
PHYSICAL STREAM ASSESSMENT
REVISIONS
SECTION 1
SECTION 2
SECTION 3
SCALE: 1" = 2'


CARROLL COUNTY
LAND AND RESOURCE MANAGEMENT
N.P.D.E.S. PERMIT
PHYSICAL STREAM ASSESSMENT
REVISIONS
SECTION 6
SECTION 5
SECTION 4
EXISTING GROUND (Initial Survey) (4+00)
EXISTING GROUND (4/17)
EXISTING GROUND (2/18)
Left Stream Edge (4/00)
Left Stream Edge (4/17)
Left Stream Edge (2/18)
Right Stream Edge (4/00)
Right Stream Edge (4/17)
Right Stream Edge (2/18)

Appendix D

Appendix E

2018 Macro-Invertebrate Taxonomic Identifications Results

Order	Family	Taxon	Outfall	Instream
Coleoptera	Dytiscidae	Agabus	2	
Coleoptera	Elmidae	ELMIDAE		2
Coleoptera	Elmidae	Optioservus		10
Coleoptera	Elmidae	Stenelmis	20	8
Diptera	Ceratopogonidae	CERATOPOGONIDAE	2	
Diptera	Ceratopogonidae	Culicoides	1	
Diptera	Chironomidae	Ablabesmyia	1	1
Diptera	Chironomidae	Chaetocladius	3	
Diptera	Chironomidae	Chironomini	2	
Diptera	Chironomidae	Cricotopus		5
Diptera	Chironomidae	Diamesa	2	
Diptera	Chironomidae	Eukiefferiella		1
Diptera	Chironomidae	Nanocladius	1	
Diptera	Chironomidae	Nilotanypus		1
Diptera	Chironomidae	Parametriocnemus	21	8
Diptera	Chironomidae	Phaenopsectra	1	
Diptera	Chironomidae	Polypedilum	6	
Diptera	Chironomidae	Rheocricotopus	8	16
Diptera	Chironomidae	Rheotanytarsus		1
Diptera	Chironomidae	Stempellinella		7
Diptera	Chironomidae	Stictochironomus	1	
Diptera	Chironomidae	Stilocladius		1
Diptera	Chironomidae	TANYTARSINI		1
Diptera	Chironomidae	Tanytarsus	10	6
Diptera	Chironomidae	Thienemannimyia	13	10
Diptera	Simuliidae	Simulium		1
Diptera	Tipulidae	Antocha	1	
Ephemeroptera	Baetidae	Diphetor		19
Ephemeroptera	Leptophlebiidae	LEPTOPHLEBIIDAE		1
Haplotaxida	Enchytraeidae	ENCHYTRAEIDAE		1
Haplotaxida	Naididae	NAIDIDAE	1	
Trichoptera	Hydropsychidae	Cheumatopsyche	2	10
Trichoptera	Hydropsychidae	Hydropsyche	2	7
Trichoptera	Limnephilidae	Pycnopsyche	1	

Order	Family	Taxon	Outfall	Instream
Trichoptera	Psychomyiidae	Lype	1	
Trichoptera	Uenoidae	Neophylax		2
Tricladida	Dugesiidae	Girardia	1	
Tubificida	Tubificidae	TUBIFICIDAE	5	
Veneroida	Pisidiidae	Musculium	3	
		Total Individuals	111	119
		Total Taxa	25	22

Appendix F

Chesapeake Bay and Local TMDL Reductions

Appendix F

Modeling with Mapshed

The MapShed (version 1.3.0; MapShed, 2015) tool developed by Penn State University was utilized by the Bureau of Resource Management to document progress towards meeting the stormwater WLA. This modeling approach allowed for specific local data (streams, topology, and land use) to be used as the basis for TN, TP, and TSS reductions rather than the broader accounting procedure used by the Chesapeake Bay Watershed Model.

Model Description

MapShed is a customized GIS interface that is used to create input data for the enhanced version of the Generalized Watershed Loading Function (GWLF-E) watershed model. The MapShed tool uses hydrology, land cover, soils, topography, weather, pollutant discharges, and other critical environmental data to develop an input file for the GWLF-E model. The basic process when using MapShed is: 1) select an area of interest, 2) create GWLF-E model input files, 3) run the GWLF-E simulation model, and 4) view the output. The MapShed geospatial evaluator and the GWLF-E models have been used for TMDL studies in Pennsylvania (Betz & Evans, 2015), New York (Cadmus, 2009), and New England (Penn State, 2016).

Chesapeake Bay TMDL baseline loads and required reductions for Carroll County were obtained from MDE and used in conjunction with the 2014 MDE Guidance document entitled: *Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated* to evaluate Bay restoration progress. Loading rates of TN, TP, and TSS for urban land were obtained from MDE (MDE, 2014) and used to calculate load reductions from BMPs. These loading rates from MDE were used instead of developing watershed-specific loading rates using MapShed because they correspond to the broader accounting procedure used by the Chesapeake Bay Watershed Model.

Delivered load ratios were applied to BMP load reductions calculated using the 2014 MDE Guidance document so that they correspond to the Bay TMDL delivered load allocations and required reductions.

Completed structural and nonstructural projects by watershed along with the net change in pollutant load reductions are shown in the following tables. Edge of stream versus delivered for each watershed is also summarized to show how local WLA's translate into reductions for the Chesapeake Bay TMDL.

Chesapeake Bay TMDL Edge-of-Stream Load Reduction Calculations

Prettyboy Watershed

Stormwater Facility Impervious Treatment– Prettyboy Watershed

Project	Project Type	Drainage Area (Ac)	Impervious Area (Acres)	Practice Type	Runoff depth treated (In.)	TN Pollutant Runoff Load	Total Loads (lbs)	TN BMP Efficiency (%)	TN Pollutant Loads Reduced (lbs)	TP Pollutant Load	Total Loads (lbs)	TP BMP Efficiency	TP Pollutant Loads Reduced (lbs)	TSS Pollutant Load	Total Loads (tons)	TSS BMP Efficiency	TSS Pollutant Loads Reduced (Tons)
Small Crossings	Retrofit	26.73	9.07	RR	1.86	15.3	138.7710	67%	92.4176	1.69	15.3283	78%	11.9325	0.44	3.9908	84%	3.3342
Small Crossings	Bio-Retention	1.15	0.51	RR	1.00	15.3	7.8030	60%	4.6623	1.69	0.8619	70%	0.6025	0.44	0.2244	75%	0.1681

Stormwater Facility Pervious Treatment– Prettyboy Watershed

Project	Project Type	Drainage Area (Ac)	Pervious Area (Ac)	Practice Type	Runoff depth treated (In.)	TN Pollutant Runoff Load	Total Loads (lbs)	TN BMP Efficiency (%)	TN Pollutant Loads Reduced (lbs)	TP Pollutant Load	Total Loads (lbs)	TP BMP Efficiency	TP Pollutant Loads Reduced (lbs)	TSS Pollutant Load	Total Loads (tons)	TSS BMP Efficiency	TSS Pollutant Loads Reduced (Tons)
Small Crossings	Retrofit	26.73	17.66	RR	1.86	10.8	190.7280	67%	127.0195	0.43	7.5938	78%	5.9115	0.07	1.2362	84%	1.0328
Small Crossings	Bio-Retention	1.15	0.64	RR	1.00	10.8	6.9120	60%	4.1299	0.43	0.2752	70%	0.1924	0.07	0.0448	75%	0.0336

Impervious to Pervious– Prettyboy Watershed

Location	Acres	TN Pollutant Load	Total Loads (lbs)	TN BMP Efficiency (%)	TN Pollutant Loads Reduced (lbs)	TP Pollutant Load	Total Loads (lbs)	TP BMP Efficiency	TP Pollutant Loads Reduced (lbs)	TSS Pollutant Load (tons/ac)	Total Loads (tons)	TSS BMP Efficiency	TSS Pollutant Loads Reduced (Tons)
Hampstead	0.42	11.7	4.914	13	0.63882	0.68	0.2856	72	0.205632	0.18	0.0756	84	0.063504
Manchester	0.81	11.7	9.477	13	1.23201	0.68	0.5508	72	0.396576	0.18	0.1458	84	0.122472
		Total:	**14.3910**		**1.8708**		**0.8364**		**0.6022**		**0.2214**		**0.1860**

Buffer Plantings – Prettyboy Watershed

Project	Acres	TN Pollutant Load	Total Loads (lbs)	TN BMP Efficiency (%)	TN Pollutant Loads Reduced (lbs)	TP Pollutant Load	Total Loads (lbs)	TP BMP Efficiency	TP Pollutant Loads Reduced (lbs)	TSS Pollutant Load	Total Loads (tons)	TSS BMP Efficiency	TSS Pollutant Loads Reduced (Tons)
Planting 1	0.53	10.8	5.7240	66	3.7778	0.43	0.2279	77	0.1755	0.07	0.0371	57	0.0211
Planting 3	0.44	10.8	4.7520	66	3.1363	0.43	0.1892	77	0.1457	0.07	0.0308	57	0.0176
Planting 4	0.35	10.8	3.7800	66	2.4948	0.43	0.1505	77	0.1159	0.07	0.0245	57	0.0140
Planting 5	1.95	10.8	21.0600	66	13.8996	0.43	0.8385	77	0.6456	0.07	0.1365	57	0.0778
Charlotte's Quest	0.52	10.8	5.6160	66	3.7066	0.43	0.2236	77	0.1722	0.07	0.0364	57	0.0207
Manchester Streetscapes*	0.41	10.8	4.4280	66	2.9225	0.43	0.1763	77	0.1358	0.07	0.0287	57	0.0164
Planting 6	2.48	10.8	26.7840	66	17.6774	0.43	1.0664	77	0.8211	0.07	0.1736	57	0.0990
Planting 7	1.77	10.8	19.1160	66	12.6166	0.43	0.7611	77	0.5860	0.07	0.1239	57	0.0706
Planting 8	0.38	10.8	4.1040	66	2.7086	0.43	0.1634	77	0.1258	0.07	0.0266	57	0.0152
Planting 9	0.4	10.8	4.3200	66	2.8512	0.43	0.1720	77	0.1324	0.07	0.0280	57	0.0160
Planting 10	0.41	10.8	4.4280	66	2.9225	0.43	0.1763	77	0.1358	0.07	0.0287	57	0.0164
Total:	**9.64**		**104.1120**		**68.7139**		**4.1452**		**3.1918**		**0.6748**		**0.3846**

Catch Basin/Inlet Cleaning– Prettyboy Watershed

Location	Tons	TN lbs reduced/ton	TN Pollutant Loads Reduced (lbs)	TP lbs reduced/ton	TP Pollutant Loads Reduced (lbs)	TSS lbs reduced/ton	TSS Pollutant Loads Reduced (lbs)	TSS Pollutant Loads Reduced (Tons)
Hampstead	9.62	3.5	33.670	1.4	13.468	420	4040.4	2.020
Manchester	0	3.5	0.000	1.4	0.000	420	0	0.000
		Total:	**33.6700**		**13.4680**		**4,040**	**2.020**

School Raingardens– Prettyboy Watershed

School	Drainage Area (Ac.)	Practice Type	Runoff depth treated (In.)	TN Pollutant Runoff Load	Total N Loads (lbs)	TN BMP Efficiency (%)	TN Pollutant Loads Reduced (lbs)	TP Pollutant Load	Total P Loads (lbs)	TP BMP Efficiency	TP Pollutant Loads Reduced (lbs)	TSS Pollutant Load	Total Loads (tons)	TSS BMP Efficiency	TSS Pollutant Loads Reduced (Tons)
Ebb Valley	0.230	ST	1.000	11.7	2.6860	33	0.8864	0.68	0.1561	52	0.0812	0.18	0.0413	66	0.0273
Manchester	0.264	ST	1.000	11.7	3.0888	33	1.0193	0.68	0.1795	52	0.0934	0.18	0.0475	66	0.0314
	0.494			**Total:**	**5.7748**		**1.9057**		**0.3356**		**0.1745**		**0.0888**		**0.0586**

Floodplain Protection Easements– Prettyboy Watershed

Subdivision	Acres	Recorded Date	TN Pollutant Load	Total Loads (lbs)	TN BMP Efficiency (%)	TN Pollutant Loads Reduced (lbs)	TP Pollutant Load	Total Loads (lbs)	TP BMP Efficiency	TP Pollutant Loads Reduced (lbs)	TSS Pollutant Load	Total Loads (tons)	TSS BMP Efficiency	TSS Pollutant Loads Reduced (Tons)
Curren's Manor	0.053	2/16/05	11.7	0.6208	30	0.1863	0.68	0.0361	40	0.0144	0.18	0.0096	55	0.0053
Grandview Manor	0.004	11/1/05	11.7	0.0475	30	0.0143	0.68	0.0028	40	0.0011	0.18	0.0007	55	0.0004
Charles Sutton Property	0.028	6/20/06	11.7	0.3227	30	0.0968	0.68	0.0188	40	0.0075	0.18	0.0050	55	0.0027
Bachman Overlook	0.128	11/27/06	11.7	1.4941	30	0.4482	0.68	0.0868	40	0.0347	0.18	0.0230	55	0.0126
Manchester/Black Farm, LLC	1.753	4/17/07	11.7	20.5127	30	6.1538	0.68	1.1922	40	0.4769	0.18	0.3156	55	0.1736
Hampstead Marketplace	0.803	5/2/07	11.7	9.3941	30	2.8182	0.68	0.5460	40	0.2184	0.18	0.1445	55	0.0795
Leister Park	0.843	5/20/11	11.7	9.8668	30	2.9601	0.68	0.5735	40	0.2294	0.18	0.1518	55	0.0835
Melrose Crossings, LLC	0.170	9/29/11	11.7	1.9852	30	0.5956	0.68	0.1154	40	0.0462	0.18	0.0305	55	0.0168
Manchester Valley High School	0.990	8/30/12	11.7	11.5810	30	3.4743	0.68	0.6731	40	0.2692	0.18	0.1782	55	0.0980
Little Roundtop, Section 2	0.027	2/7/12	11.7	0.3125	30	0.0938	0.68	0.0182	40	0.0073	0.18	0.0048	55	0.0026
Majestic Knolls	0.250	5/23/02	11.7	2.9246	30	0.8774	0.68	0.1700	40	0.0680	0.18	0.0450	55	0.0247
Maple Grove Equipment & Material Storage Yard	0.241	7/14/15	11.7	2.8248	30	0.8475	0.68	0.1642	40	0.0657	0.18	0.0435	55	0.0239
North Carroll Farms 5	0.652	3/9/15	11.7	7.6260	30	2.2878	0.68	0.4432	40	0.1773	0.18	0.1173	55	0.0645
St. Bartholomew	0.004	11/8/05	11.7	0.0491	30	0.0147	0.68	0.0029	40	0.0011	0.18	0.0008	55	0.0004
Sterner Estates, Section 5	0.034	5/11/06	11.7	0.3932	30	0.1180	0.68	0.0229	40	0.0091	0.18	0.0060	55	0.0033
	5.979		**Total:**	**69.9554**		**20.9866**		**4.0658**		**1.6263**		**1.0762**		**0.5919**

Water Resource Easements– Prettyboy Watershed

Subdivision	Acres	Recorded Date	TN Pollutant Load	Total Loads (lbs)	TN BMP Efficiency (%)	TN Pollutant Loads Reduced (lbs)	TP Pollutant Load	Total Loads (lbs)	TP BMP Efficiency	TP Pollutant Loads Reduced (lbs)	TSS Pollutant Load	Total Loads (tons)	TSS BMP Efficiency	TSS Pollutant Loads Reduced (Tons)
The Farms at Spencer's Choice 2	0.849	6/25/03	11.7	9.9281	30	2.97844	0.68	0.5770	40	0.2308	0.18	0.1527	55	0.0840
The Farms at Spencer's Choice 1	0.683	4/17/95	11.7	7.9895	30	2.39685	0.68	0.4643	40	0.1857	0.18	0.1229	55	0.0676
Sterner Estates Section 4	0.386	4/23/97	11.7	4.5178	30	1.35534	0.68	0.2626	40	0.1050	0.18	0.0695	55	0.0382
Indian Run	3.081	8/8/97	11.7	36.0511	30	10.81532	0.68	2.0953	40	0.8381	0.18	0.5546	55	0.3050
Young Man's Fancy	1.645	1/7/98	11.7	19.2495	30	5.77484	0.68	1.1188	40	0.4475	0.18	0.2961	55	0.1629
Snyder Heights Section II	3.449	4/23/98	11.7	40.3487	30	12.10461	0.68	2.3451	40	0.9380	0.18	0.6207	55	0.3414
Bog Hill	1.887	6/9/98	11.7	22.0768	30	6.62305	0.68	1.2831	40	0.5132	0.18	0.3396	55	0.1868
California Dreamin	1.307	6/19/00	11.7	15.2911	30	4.58733	0.68	0.8887	40	0.3555	0.18	0.2352	55	0.1294
Ipstone 2	2.012	2/22/01	11.7	23.5437	30	7.06310	0.68	1.3683	40	0.5473	0.18	0.3622	55	0.1992
Bluebird Hills	1.241	10/19/01	11.7	14.5204	30	4.35612	0.68	0.8439	40	0.3376	0.18	0.2234	55	0.1229
Majestic Knolls	3.158	5/16/02	11.7	36.9507	30	11.08520	0.68	2.1476	40	0.8590	0.18	0.5685	55	0.3127
Mar-Lin Equine Rereat	5.736	10/28/02	11.7	67.1110	30	20.13330	0.68	3.9005	40	1.5602	0.18	1.0325	55	0.5679
Currens Manor	2.912	2/25/05	11.7	34.0750	30	10.22249	0.68	1.9804	40	0.7922	0.18	0.5242	55	0.2883
St. Bartholomew's Catholic	0.618	11/8/05	11.7	7.2346	30	2.17037	0.68	0.4205	40	0.1682	0.18	0.1113	55	0.0612
Grandview Manor	0.189	11/10/05	11.7	2.2080	30	0.66239	0.68	0.1283	40	0.0513	0.18	0.0340	55	0.0187
Wight-Geiwitz Property OC	1.115	12/5/05	11.7	13.0467	30	3.91402	0.68	0.7583	40	0.3033	0.18	0.2007	55	0.1104
Bachman Overlook	10.880	12/6/06	11.7	127.2941	30	38.18822	0.68	7.3983	40	2.9593	0.18	1.9584	55	1.0771
Hallie Hill Farm, Section 2	3.952	2/20/07	11.7	46.2439	30	13.87316	0.68	2.6877	40	1.0751	0.18	0.7114	55	0.3913
Leister Park	12.900	1/11/11	11.7	150.9348	30	45.28044	0.68	8.7723	40	3.5089	0.18	2.3221	55	1.2771
Melrose Crossings, LLC	4.432	9/29/11	11.7	51.8522	30	15.55567	0.68	3.0136	40	1.2055	0.18	0.7977	55	0.4387
Little Roundtop, Section 2	0.997	2/7/12	11.7	11.6707	30	3.50120	0.68	0.6783	40	0.2713	0.18	0.1795	55	0.0988
Manchester Valley High School	4.133	8/30/12	11.7	48.3512	30	14.50535	0.68	2.8102	40	1.1241	0.18	0.7439	55	0.4091
Crestview Meadows Section V	0.002	4/24/13	11.7	0.0189	30	0.00567	0.68	0.0011	40	0.0004	0.18	0.0003	55	0.0002
Maple Grove Equipment & Material Storage Yard	1.494	7/10/15	11.7	17.4761	30	5.24284	0.68	1.0157	40	0.4063	0.18	0.2689	55	0.1479
	69.059		**Total:**	**807.9845**		**242.39534**		**46.9598**		**18.7839**		**12.4305**		**6.8368**

Chesapeake Bay TMDL Edge-of-Stream Load Reduction Calculations

Loch Raven Watershed

Catch Basin/Inlet Cleaning– Loch Raven Watershed

Location	Tons	TN lbs reduced/ton	TN Pollutant Loads Reduced (lbs)	TP lbs reduced/ton	TP Pollutant Loads Reduced (lbs)	TSS lbs reduced/ton	TSS Pollutant Loads Reduced (lbs)	TSS Pollutant Loads Reduced (Tons)
Hampstead	13.54	3.5	47.390	1.4	18.956	420	5686.8	2.843
		3.5	0.000	1.4	0.000	420	0	0.000
		Total:	**47.3900**		**18.9560**		**5,687**	**2.843**

Chesapeake Bay TMDL Edge-of-Stream Load Reduction Calculations

Lower Monocacy Watershed

Buffer Plantings – Lower Monocacy Watershed

Project	Acres	TN Pollutant Load	Total Loads (lbs)	TN BMP Efficiency (%)	TN Pollutant Loads Reduced (lbs)	TP Pollutant Load	Total Loads (lbs)	TP BMP Efficiency	TP Pollutant Loads Reduced (lbs)	TSS Pollutant Load	Total Loads (tons)	TSS BMP Efficiency	TSS Pollutant Loads Reduced (Tons)
Planting 1	0.51	10.8	5.5080	66	3.6353	0.43	0.2193	77	0.1689	0.07	0.0357	57	0.0203
Planting 2	0.58	10.8	6.2640	66	4.1342	0.43	0.2494	77	0.1920	0.07	0.0406	57	0.0231
Planting 3	1.2	10.8	12.9600	66	8.5536	0.43	0.5160	77	0.3973	0.07	0.0840	57	0.0479
Planting 4	5.8	10.8	62.6400	66	41.3424	0.43	2.4940	77	1.9204	0.07	0.4060	57	0.2314
Planting 5	0.44	10.8	4.7520	66	3.1363	0.43	0.1892	77	0.1457	0.07	0.0308	57	0.0176
Planting 6	0.43	10.8	4.6440	66	3.0650	0.43	0.1849	77	0.1424	0.07	0.0301	57	0.0172
Planting 7	0.53	10.8	5.7240	66	3.7778	0.43	0.2279	77	0.1755	0.07	0.0371	57	0.0211
Planting 8	1.44	10.8	15.5520	66	10.2643	0.43	0.6192	77	0.4768	0.07	0.1008	57	0.0575
Planting 9	0.28	10.8	3.0240	66	1.9958	0.43	0.1204	77	0.0927	0.07	0.0196	57	0.0112
Planting 10	0.61	10.8	6.5880	66	4.3481	0.43	0.2623	77	0.2020	0.07	0.0427	57	0.0243
Planting 11	0.18	10.8	1.9440	66	1.2830	0.43	0.0774	77	0.0596	0.07	0.0126	57	0.0072
Planting 12	0.22	10.8	2.3760	66	1.5682	0.43	0.0946	77	0.0728	0.07	0.0154	57	0.0088
Total:	**12.22**		**131.9760**		**87.1042**		**5.2546**		**4.0460**		**0.8554**		**0.4876**

Catch Basin/Inlet Cleaning– Lower Monocacy Watershed

Location	Tons	TN lbs reduced/ton	TN Pollutant Loads Reduced (lbs)	TP lbs reduced/ton	TP Pollutant Loads Reduced (lbs)	TSS lbs reduced/ton	TSS Pollutant Loads Reduced (lbs)	TSS Pollutant Loads Reduced (Tons)
Mount Airy	3.65	3.5	12.775	1.4	5.110	420	1533	0.767
		Total:	**12.7750**		**5.1100**		**1,533**	**0.767**

Water Resource Easements– Lower Monocacy Watershed

Subdivision	Acres	Recorded Date	TN Pollutant Load	Total Loads (lbs)	TN BMP Efficiency (%)	TN Pollutant Loads Reduced (lbs)	TP Pollutant Load	Total Loads (lbs)	TP BMP Efficiency	TP Pollutant Loads Reduced (lbs)	TSS Pollutant Load	Total Loads (tons)	TSS BMP Efficiency	TSS Pollutant Loads Reduced (Tons)
Laney Property	1.659	07/25/11	11.7	19.4103	30	5.82309	0.68	1.1281	40	0.4512	0.18	0.2986	55	0.1642
			Total:	**19.4103**		**5.82309**		**1.1281**		**0.4512**		**0.2986**		**0.1642**

Chesapeake Bay TMDL Edge-of-Stream Load Reduction Calculations

Upper Monocacy Watershed

Buffer Plantings – Upper Monocacy Watershed

Project	Acres	TN Pollutant Load	Total Loads (lbs)	TN BMP Efficiency (%)	TN Pollutant Loads Reduced (lbs)	TP Pollutant Load	Total Loads (lbs)	TP BMP Efficiency	TP Pollutant Loads Reduced (lbs)	TSS Pollutant Load	Total Loads (tons)	TSS BMP Efficiency	TSS Pollutant Loads Reduced (Tons)
Planting 1	13.19	10.8	142.4520	66	94.0183	0.43	5.6717	77	4.3672	0.07	0.9233	57	0.5263
Planting 2	0.51	10.8	5.5080	66	3.6353	0.43	0.2193	77	0.1689	0.07	0.0357	57	0.0203
Planting 3	0.97	10.8	10.4760	66	6.9142	0.43	0.4171	77	0.3212	0.07	0.0679	57	0.0387
Planting 4	0.85	10.8	9.1800	66	6.0588	0.43	0.3655	77	0.2814	0.07	0.0595	57	0.0339
Planting 5	0.95	10.8	10.2600	66	6.7716	0.43	0.4085	77	0.3145	0.07	0.0665	57	0.0379
Planting 6	7	10.8	75.6000	66	49.8960	0.43	3.0100	77	2.3177	0.07	0.4900	57	0.2793
Planting 7	0.65	10.8	7.0200	66	4.6332	0.43	0.2795	77	0.2152	0.07	0.0455	57	0.0259
Planting 8	2.18	10.8	23.5440	66	15.5390	0.43	0.9374	77	0.7218	0.07	0.1526	57	0.0870
Planting 9	1.9	10.8	20.5200	66	13.5432	0.43	0.8170	77	0.6291	0.07	0.1330	57	0.0758
Total:	**28.2**		**304.5600**		**201.0096**		**12.1260**		**9.3370**		**1.9740**		**1.1252**

Catch Basin/Inlet Cleaning– Upper Monocacy Watershed

Location	Tons	TN lbs reduced/ton	TN Pollutant Loads Reduced (lbs)	TP lbs reduced/ton	TP Pollutant Loads Reduced (lbs)	TSS lbs reduced/ton	TSS Pollutant Loads Reduced (lbs)	TSS Pollutant Loads Reduced (Tons)
Taneytown	0.08	3.5	0.280	1.4	0.112	420	33.6	0.017
		Total:	**0.2800**		**0.1120**		**34**	**0.017**

Water Resource Easements– Upper Monocacy Watershed

Subdivision	Acres	Recorded Date	TN Pollutant Load	Total Loads (lbs)	TN BMP Efficiency (%)	TN Pollutant Loads Reduced (lbs)	TP Pollutant Load	Total Loads (lbs)	TP BMP Efficiency	TP Pollutant Loads Reduced (lbs)✚	TSS Pollutant Load	Total Loads (tons)	TSS BMP Efficiency	TSS Pollutant Loads Reduced (Tons)
Walnut Grove Acres	6.511	8/7/01	11.7	76.1787	30	22.85361	0.68	4.4275	40	1.7710	0.18	1.1720	55	0.6446
Angelina Farms	0.520	9/17/01	11.7	6.0840	30	1.82520	0.68	0.3536	40	0.1414	0.18	0.0936	55	0.0515
H&K Acres	3.991	4/11/05	11.7	46.6947	30	14.00841	0.68	2.7139	40	1.0856	0.18	0.7184	55	0.3951
Stonesifer Property	0.094	3/22/07	11.7	1.0998	30	0.32994	0.68	0.0639	40	0.0256	0.18	0.0169	55	0.0093
Bullfrog Plateau	1.197	5/13/11	11.7	14.0049	30	4.20147	0.68	0.8140	40	0.3256	0.18	0.2155	55	0.1185
Hutchinson Family Ltd Partnersh	1.639	5/19/11	11.7	19.1763	30	5.75289	0.68	1.1145	40	0.4458	0.18	0.2950	55	0.1623
Maiden's Point	1.010	12/22/11	11.7	11.8170	30	3.54510	0.68	0.6868	40	0.2747	0.18	0.1818	55	0.1000
Harman, Blaine & Angela Proper	1.295	9/10/12	11.7	15.1515	30	4.54545	0.68	0.8806	40	0.3522	0.18	0.2331	55	0.1282
Maiden's Point 2	5.385	6/16/15	11.7	63.0045	30	18.90135	0.68	3.6618	40	1.4647	0.18	0.9693	55	0.5331
	21.642		**Total:**	**253.2114**		**75.96342**		**7.1577**		**2.8631**		**3.8956**		**2.1426**

✚ The Upper Monocacy Watershed has varying baseline years for local TMDLs. The red indicates that particular BMP was not included in the reduction for that individual pollutant as the date implemented was prior to the baseline year.

Floodplain Protection Easements– Upper Monocacy Watershed

Subdivision	Acres	Recorded Date	TN Pollutant Load	Total Loads (lbs)	TN BMP Efficiency (%)	TN Pollutant Loads Reduced (lbs)	TP Pollutant Load	Total Loads (lbs)	TP BMP Efficiency	TP Pollutant Loads Reduced (lbs)✚	TSS Pollutant Load	Total Loads (tons)	TSS BMP Efficiency	TSS Pollutant Loads Reduced (Tons)
H&K Acres	0.005	4/11/05	11.7	0.0585	30	0.0176	0.68	0.0034	40	0.0014	0.18	0.0009	55	0.0005
Bullfrog Plateau	0.001	5/13/11	11.7	0.0117	30	0.0035	0.68	0.0007	40	0.0003	0.18	0.0002	55	0.0001
Maiden's Point	0.032	12/22/11	11.7	0.3744	30	0.1123	0.68	0.0218	40	0.0087	0.18	0.0058	55	0.0032
Walnut Grove Acres	6.069	4/10/12	11.7	71.0073	30	21.3022	0.68	4.1269	40	1.6508	0.18	1.0924	55	0.6008
	6.107		**Total:**	**71.4519**		**21.4356**		**4.1528**		**1.6597**		**1.0993**		**0.6046**

✚The Upper Monocacy Watershed has varying baseline years for local TMDLs. The red indicates that particular BMP was not included in the reduction for that individual pollutant as the date implemented was prior to the baseline year.

Chesapeake Bay TMDL Edge-of-Stream Load Reduction Calculations

Liberty Watershed

Catch Basin/Inlet Cleaning– Liberty Watershed

Location	Tons	TN lbs reduced/ton	TN Pollutant Loads Reduced (lbs)	TP lbs reduced/ton	TP Pollutant Loads Reduced (lbs)	TSS lbs reduced/ton	TSS Pollutant Loads Reduced (lbs)	TSS Pollutant Loads Reduced (Tons)
Hampstead	5.71	3.5	19.985	1.4	7.994	420	2398.2	1.199
Manchester		3.5	0.000	1.4	0.000	420	0	0.000
Westminster	0.91	3.5	3.185	1.4	1.274	420	382.2	0.191
		Total:	**23.1700**		**9.2680**		**2,780**	**1.390**

Street Sweeping– Liberty Watershed

Location	Acres	TN Pollutant Load	Total Loads (lbs)	TN BMP Efficiency (%)	TN Pollutant Loads Reduced (lbs)	TP Pollutant Load	Total Loads (lbs)	TP BMP Efficiency	TP Pollutant Loads Reduced (lbs)	TSS Pollutant Load (tons/ac)	Total Loads (tons)	TSS BMP Efficiency	TSS Pollutant Loads Reduced (Tons)
Westminster	5.28	11.7	61.776	4	2.47104	0.68	3.5904	4	0.143616	0.18	0.9504	10	0.09504
		Total:	**61.7760**		**2.4710**		**3.5904**		**0.1436**		**0.9504**		**0.0950**

Buffer Plantings – Liberty Watershed

Project	Acres	TN Pollutant Load	Total Loads (lbs)	TN BMP Efficiency (%)	TN Pollutant Loads Reduced (lbs)	TP Pollutant Load	Total Loads (lbs)	TP BMP Efficiency	TP Pollutant Loads Reduced (lbs)	TSS Pollutant Load	Total Loads (tons)	TSS BMP Efficiency	TSS Pollutant Loads Reduced (Tons)
Planting 1	0.14	10.8	1.5120	66	0.9979	0.43	0.0602	77	0.0464	0.07	0.0098	57	0.0056
Planting 2	1.43	10.8	15.4440	66	10.1930	0.43	0.6149	77	0.4735	0.07	0.1001	57	0.0571
Planting 3	1.19	10.8	12.8520	66	8.4823	0.43	0.5117	77	0.3940	0.07	0.0833	57	0.0475
Planting 4	0.6	10.8	6.4800	66	4.2768	0.43	0.2580	77	0.1987	0.07	0.0420	57	0.0239
Planting 5	0.32	10.8	3.4560	66	2.2810	0.43	0.1376	77	0.1060	0.07	0.0224	57	0.0128
Planting 6	0.31	10.8	3.3480	66	2.2097	0.43	0.1333	77	0.1026	0.07	0.0217	57	0.0124
Planting 7	0.3	10.8	3.2400	66	2.1384	0.43	0.1290	77	0.0993	0.07	0.0210	57	0.0120
Planting 8	0.16	10.8	1.7280	66	1.1405	0.43	0.0688	77	0.0530	0.07	0.0112	57	0.0064
Planting 9	1.02	10.8	11.0160	66	7.2706	0.43	0.4386	77	0.3377	0.07	0.0714	57	0.0407
Planting 10	0.84	10.8	9.0720	66	5.9875	0.43	0.3612	77	0.2781	0.07	0.0588	57	0.0335
Planting 11	3.18	10.8	34.3440	66	22.6670	0.43	1.3674	77	1.0529	0.07	0.2226	57	0.1269
Planting 12	2.92	10.8	31.5360	66	20.8138	0.43	1.2556	77	0.9668	0.07	0.2044	57	0.1165
Planting 13	1.15	10.8	12.4200	66	8.1972	0.43	0.4945	77	0.3808	0.07	0.0805	57	0.0459
Planting 14	0.24	10.8	2.5920	66	1.7107	0.43	0.1032	77	0.0795	0.07	0.0168	57	0.0096
Planting 15	0.52	10.8	5.6160	66	3.7066	0.43	0.2236	77	0.1722	0.07	0.0364	57	0.0207
Planting 16	1.41	10.8	15.2280	66	10.0505	0.43	0.6063	77	0.4669	0.07	0.0987	57	0.0563
Planting 17	0.1	10.8	1.0800	66	0.7128	0.43	0.0430	77	0.0331	0.07	0.0070	57	0.0040
Planting 18	4.06	10.8	43.8480	66	28.9397	0.43	1.7458	77	1.3443	0.07	0.2842	57	0.1620
Planting 19	1.22	10.8	13.1760	66	8.6962	0.43	0.5246	77	0.4039	0.07	0.0854	57	0.0487
Planting 20	0.21	10.8	2.2680	66	1.4969	0.43	0.0903	77	0.0695	0.07	0.0147	57	0.0084
Planting 21	0.87	10.8	9.3960	66	6.2014	0.43	0.3741	77	0.2881	0.07	0.0609	57	0.0347
Planting 22	0.1	10.8	1.0800	66	0.7128	0.43	0.0430	77	0.0331	0.07	0.0070	57	0.0040
Planting 23	0.76	10.8	8.2080	66	5.4173	0.43	0.3268	77	0.2516	0.07	0.0532	57	0.0303
Planting 24	0.44	10.8	4.7520	66	3.1363	0.43	0.1892	77	0.1457	0.07	0.0308	57	0.0176
Planting 25	0.38	10.8	4.1040	66	2.7086	0.43	0.1634	77	0.1258	0.07	0.0266	57	0.0152
Planting 26	0.3	10.8	3.2400	66	2.1384	0.43	0.1290	77	0.0993	0.07	0.0210	57	0.0120
Planting 27	0.16	10.8	1.7280	66	1.1405	0.43	0.0688	77	0.0530	0.07	0.0112	57	0.0064
Planting 28	0.2	10.8	2.1600	66	1.4256	0.43	0.0860	77	0.0662	0.07	0.0140	57	0.0080
Planting 29	0.9	10.8	9.7200	66	6.4152	0.43	0.3870	77	0.2980	0.07	0.0630	57	0.0359
Planting 30	0.38	10.8	4.1040	66	2.7086	0.43	0.1634	77	0.1258	0.07	0.0266	57	0.0152
Planting 31	0.11	10.8	1.1880	66	0.7841	0.43	0.0473	77	0.0364	0.07	0.0077	57	0.0044
Total:	**25.92**		**279.9360**		**184.7578**		**11.1456**		**8.5821**		**1.8144**		**1.0342**

Streambank Regeneration – Liberty Watershed

Location	Linear Feet	TN lbs reduced/linear ft	TN Pollutant Loads Reduced (lbs)	TP lbs reduced/linear ft	TP Pollutant Loads Reduced (lbs)	TSS lbs reduced/linear ft	TSS Pollutant Loads Reduced (lbs)	TSS Pollutant Loads Reduced (Tons)
Hickory Ridge	165	0.075	12.375	0.068	11.220	44.88	7405.2	3.703
Marriot Wood 1 Facility #2	150	0.075	11.250	0.068	10.200	44.88	6732	3.366
Edgewood Section 1	240	0.075	18.000	0.068	16.320	44.88	10771.2	5.386
Heritage Heights	510	0.075	38.250	0.068	34.680	44.88	22888.8	11.444
Westminster High School	416	0.075	31.200	0.068	28.288	44.88	18670.08	9.335
Central MD	960	0.075	72.000	0.068	65.280	44.88	43084.8	21.542
Hoff Pond	822	0.075	61.650	0.068	55.896	44.88	36891.36	18.446
		Total:	**244.7250**		**221.8840**		**146,443**	**73.222**

Water Resource Easements– Liberty Watershed

Subdivision	Date Recorded	Acres	TN Pollutant Load	Total Loads (lbs)	TN BMP Efficiency (%)	TN Pollutant Loads Reduced (lbs)	TP Pollutant Load	Total Loads (lbs)	TP BMP Efficiency	TP Pollutant Loads Reduced (lbs)	TSS Pollutant Load	Total Loads (tons)	TSS BMP Efficiency	TSS Pollutant Loads Reduced (Tons)
Hidden Valley, Section 2, Lot 24	5/6/14	1.449	11.7	16.9582	30	5.08745	0.68	0.9856	40	0.3942	0.18	0.2609	55	0.1435
Harris-Bowlsbey Property	8/13/09	0.027	11.7	0.3121	30	0.09364	0.68	0.0181	40	0.0073	0.18	0.0048	55	0.0026
The Mill at Clearfield	9/12/11	0.535	11.7	6.2588	30	1.87764	0.68	0.3638	40	0.1455	0.18	0.0963	55	0.0530
Pine Knoll Development Resub Parcel A	10/7/13	0.437	11.7	5.1131	30	1.53394	0.68	0.2972	40	0.1189	0.18	0.0787	55	0.0433
Cliff's Legacy	2/20/14	1.410	11.7	16.5009	30	4.95027	0.68	0.9590	40	0.3836	0.18	0.2539	55	0.1396
Southview Section 2	3/19/14	6.926	11.7	81.0384	30	24.31152	0.68	4.7099	40	1.8840	0.18	1.2467	55	0.6857
Beaver Run	11/13/12	24.428	11.7	285.8054	30	85.74162	0.68	16.6109	40	6.6444	0.18	4.3970	55	2.4184
Hampstead Ind. Exchange Amended Plat of Lot 2	1/20/09	14.184	11.7	165.9472	30	49.78415	0.68	9.6448	40	3.8579	0.18	2.5530	55	1.4042
Foggy Bottom Farms, Inc. Property	6/3/11	4.627	11.7	54.1345	30	16.24036	0.68	3.1463	40	1.2585	0.18	0.8328	55	0.4581
H M Associates 4th Amended Plat	1/11/10	0.212	11.7	2.4835	30	0.74505	0.68	0.1443	40	0.0577	0.18	0.0382	55	0.0210
Pinewood	2/1/13	0.006	11.7	0.0663	30	0.01988	0.68	0.0039	40	0.0015	0.18	0.0010	55	0.0006
Avalon Forest Estates	12/21/09	0.263	11.7	3.0809	30	0.92427	0.68	0.1791	40	0.0716	0.18	0.0474	55	0.0261
Estates at Liberty Reservoir	3/13/14	0.333	11.7	3.9009	30	1.17027	0.68	0.2267	40	0.0907	0.18	0.0600	55	0.0330
Marabrooke Farm	5/14/12	0.540	11.7	6.3197	30	1.89591	0.68	0.3673	40	0.1469	0.18	0.0972	55	0.0535
Pooledale Section 3	2/7/14	24.905	11.7	291.3858	30	87.41574	0.68	16.9352	40	6.7741	0.18	4.4829	55	2.4656
Tobacco Technology Inc. 3rd Amended Site Plan	9/29/14	14.241	11.7	166.6168	30	49.98503	0.68	9.6837	40	3.8735	0.18	2.5633	55	1.4098
Bull Estates	5/21/15	0.138	11.7	1.6117	30	0.48351	0.68	0.0937	40	0.0375	0.18	0.0248	55	0.0136
Hodges Park, Salt Barn	10/27/10	2.982	11.7	34.8872	30	10.46617	0.68	2.0276	40	0.8111	0.18	0.5367	55	0.2952
Liberty Exchange	5/19/10	0.086	11.7	1.0088	30	0.30263	0.68	0.0586	40	0.0235	0.18	0.0155	55	0.0085
Flat Bush	3/23/10	2.924	11.7	34.2082	30	10.26246	0.68	1.9882	40	0.7953	0.18	0.5263	55	0.2895
McGrew Property, Section 2	2/4/10	0.017	11.7	0.1997	30	0.05991	0.68	0.0116	40	0.0046	0.18	0.0031	55	0.0017
Clayton Woods Section 2	8/20/10	0.733	11.7	8.5715	30	2.57146	0.68	0.4982	40	0.1993	0.18	0.1319	55	0.0725
Stansfield Estates	6/24/14	0.055	11.7	0.6466	30	0.19398	0.68	0.0376	40	0.0150	0.18	0.0099	55	0.0055
Berrywood Village, Resub Lot A-22, Sec. A, Block 1	5/17/11	0.329	11.7	3.8535	30	1.15605	0.68	0.2240	40	0.0896	0.18	0.0593	55	0.0326
Century Hollow Phase 1	8/29/13	0.238	11.7	2.7831	30	0.83493	0.68	0.1618	40	0.0647	0.18	0.0428	55	0.0235
Hewitt's Landing	4/9/15	6.054	11.7	70.8278	30	21.24834	0.68	4.1165	40	1.6466	0.18	1.0897	55	0.5993
Beatty, LLC	1/31/13	0.742	11.7	8.6796	30	2.60387	0.68	0.5045	40	0.2018	0.18	0.1335	55	0.0734
Windy Hills Farms, Phase 1	9/12/11	1.546	11.7	18.0922	30	5.42767	0.68	1.0515	40	0.4206	0.18	0.2783	55	0.1531
Windy Hills Farms, Phase 2	7/22/13	16.979	11.7	198.6550	30	59.59650	0.68	11.5458	40	4.6183	0.18	3.0562	55	1.6809
Kennell Property Resources, LLC	3/21/11	43.017	11.7	503.3004	30	150.99012	0.68	29.2516	40	11.7007	0.18	7.7431	55	4.2587
Basler Homestead	8/31/17	0.596	11.7	6.9726	30	2.09178	0.68	0.4052	40	0.1621	0.18	0.1073	55	0.0590
Braun Hills 2nd Amended Lot 2A	8/17/16	0.508	11.7	5.9462	30	1.78387	0.68	0.3456	40	0.1382	0.18	0.0915	55	0.0503
Emray Acres Lot 1 Amended Plat	6/30/17	1.685	11.7	19.7113	30	5.91340	0.68	1.1456	40	0.4582	0.18	0.3033	55	0.1668
Hidden Creek	3/20/17	0.037	11.7	0.4308	30	0.12925	0.68	0.0250	40	0.0100	0.18	0.0066	55	0.0036
Morgan Creek	4/29/16	0.223	11.7	2.6137	30	0.78411	0.68	0.1519	40	0.0608	0.18	0.0402	55	0.0221
My Elysium, LLC	6/25/10	1.560	11.7	18.2463	30	5.47390	0.68	1.0605	40	0.4242	0.18	0.2807	55	0.1544
Nipkow Property	7/31/17	4.103	11.7	48.0072	30	14.40215	0.68	2.7902	40	1.1161	0.18	0.7386	55	0.4062
North Carroll Public Fire Training Facility	11/4/10	15.787	11.7	184.7082	30	55.41245	0.68	10.7352	40	4.2941	0.18	2.8417	55	1.5629
Poignant Acres 6	5/19/09	0.111	11.7	1.2991	30	0.38973	0.68	0.0755	40	0.0302	0.18	0.0200	55	0.0110
Poignant Acres 7	11/3/11	0.237	11.7	2.7675	30	0.83024	0.68	0.1608	40	0.0643	0.18	0.0426	55	0.0234
Sterner Property	2/18/09	7.326	11.7	85.7086	30	25.71258	0.68	4.9814	40	1.9925	0.18	1.3186	55	0.7252
The Enclave at Morgan Run	12/11/09	0.079	11.7	0.9289	30	0.27866	0.68	0.0540	40	0.0216	0.18	0.0143	55	0.0079
Wilmot Manor Section 8	8/12/09	0.688	11.7	8.0495	30	2.41484	0.68	0.4678	40	0.1871	0.18	0.1238	55	0.0681
Penguin Random House Amended	9/15/17	0.000	11.7	0.0005	30	0.00014	0.68	0.0000	40	0.0000	0.18	0.0000	55	0.0000
		203.302	**Total:**	**2378.6382**		**713.59145**		**138.2456**		**55.2983**		**36.5944**		**20.1269**

Floodplain Protection Easements– Liberty Watershed

Subdivision	Date Recorded	Acres	TN Pollutant Load	Total Loads (lbs)	TN BMP Efficiency (%)	TN Pollutant Loads Reduced (lbs)	TP Pollutant Load	Total Loads (lbs)	TP BMP Efficiency	TP Pollutant Loads Reduced (lbs)	TSS Pollutant Load	Total Loads (tons)	TSS BMP Efficiency	TSS Pollutant Loads Reduced (Tons)
Sterner Property	2/18/09	0.003	11.7	0.0337	30	0.0101	0.68	0.0020	40	0.0008	0.18	0.0005	55	0.0003
Manchester Farms, Section 6	7/6/09	2.458	11.7	28.7599	30	8.6280	0.68	1.6715	40	0.6686	0.18	0.4425	55	0.2434
Wilmot Manor, Section 8	8/12/09	0.008	11.7	0.0883	30	0.0265	0.68	0.0051	40	0.0021	0.18	0.0014	55	0.0007
Harris-Bowlsbey Property	8/24/09	0.003	11.7	0.0320	30	0.0096	0.68	0.0019	40	0.0007	0.18	0.0005	55	0.0003
The Enclave at Morgan Run	12/11/09	0.001	11.7	0.0103	30	0.0031	0.68	0.0006	40	0.0002	0.18	0.0002	55	0.0001
Avalon Forest Estates	12/21/09	0.017	11.7	0.1998	30	0.0599	0.68	0.0116	40	0.0046	0.18	0.0031	55	0.0017
HM Associates Property	1/7/10	0.089	11.7	1.0467	30	0.3140	0.68	0.0608	40	0.0243	0.18	0.0161	55	0.0089
McGrew Property, Section 2	1/29/10	0.000	11.7	0.0014	30	0.0004	0.68	0.0001	40	0.0000	0.18	0.0000	55	0.0000
Flat Bush	3/17/10	0.053	11.7	0.6227	30	0.1868	0.68	0.0362	40	0.0145	0.18	0.0096	55	0.0053
Wheatley Property	4/19/10	1.029	11.7	12.0396	30	3.6119	0.68	0.6997	40	0.2799	0.18	0.1852	55	0.1019
Liberty Exchange	5/19/10	0.100	11.7	1.1649	30	0.3495	0.68	0.0677	40	0.0271	0.18	0.0179	55	0.0099
Clayton Woods, Section 2	8/17/10	0.021	11.7	0.2434	30	0.0730	0.68	0.0141	40	0.0057	0.18	0.0037	55	0.0021
Bollinger Estates	12/10/10	0.174	11.7	2.0358	30	0.6107	0.68	0.1183	40	0.0473	0.18	0.0313	55	0.0172
The Mill at Clearfield	9/12/11	0.000	11.7	0.0014	30	0.0004	0.68	0.0001	40	0.0000	0.18	0.0000	55	0.0000
My Ladies Manor 2	10/13/11	4.296	11.7	50.2624	30	15.0787	0.68	2.9212	40	1.1685	0.18	0.7733	55	0.4253
Marabrooke Farm	5/14/12	0.037	11.7	0.4309	30	0.1293	0.68	0.0250	40	0.0100	0.18	0.0066	55	0.0036
Beaver Run	11/13/12	0.217	11.7	2.5352	30	0.7605	0.68	0.1473	40	0.0589	0.18	0.0390	55	0.0215
Pinewood	2/1/13	0.000	11.7	0.0003	30	0.0001	0.68	0.0000	40	0.0000	0.18	0.0000	55	0.0000
Windy Hills Farms, Phase 2	7/19/13	0.417	11.7	4.8767	30	1.4630	0.68	0.2834	40	0.1134	0.18	0.0750	55	0.0413
Pooledale 3	2/7/14	1.049	11.7	12.2747	30	3.6824	0.68	0.7134	40	0.2854	0.18	0.1888	55	0.1039
Cliff's Legacy	2/20/14	0.188	11.7	2.2028	30	0.6608	0.68	0.1280	40	0.0512	0.18	0.0339	55	0.0186
Estates at Liberty Reservoir	3/13/14	0.001	11.7	0.0097	30	0.0029	0.68	0.0006	40	0.0002	0.18	0.0001	55	0.0001
Southview, Section 2	3/19/14	2.871	11.7	33.5873	30	10.0762	0.68	1.9521	40	0.7808	0.18	0.5167	55	0.2842
Hidden Valley, Sec. 2, Lot 24	5/6/14	0.013	11.7	0.1527	30	0.0458	0.68	0.0089	40	0.0035	0.18	0.0023	55	0.0013
Hewitt's Landing	4/9/15	0.011	11.7	0.1285	30	0.0386	0.68	0.0075	40	0.0030	0.18	0.0020	55	0.0011
Bollinger Estates Amended	3/14/16	2.034	11.7	23.8032	30	7.1409	0.68	1.3834	40	0.5534	0.18	0.3662	55	0.2014
Morgan Creek	4/29/16	0.439	11.7	5.1365	30	1.5409	0.68	0.2985	40	0.1194	0.18	0.0790	55	0.0435
Hidden Creek	3/20/17	0.001	11.7	0.0096	30	0.0029	0.68	0.0006	40	0.0002	0.18	0.0001	55	0.0001
		15.529	**Total:**	**181.6904**		**54.5071**		**10.5598**		**4.2239**		**2.7952**		**1.5374**

Stormwater Facility Impervious Treatment– Liberty Watershed

Project	Project Type	Drainage Area (Ac)	Impervious Area (Acres)	Practice Type	Runoff depth treated (In.)	TN Pollutant Runoff Load	Total Loads (lbs)	TN BMP Efficiency (%)	TN Pollutant Loads Reduced (lbs)	TP Pollutant Load	Total Loads (lbs)	TP BMP Efficiency	TP Pollutant Loads Reduced (lbs)	TSS Pollutant Load	Total Loads (tons)	TSS BMP Efficiency	TSS Pollutant Loads Reduced (Tons)
Marriot Wood 1 Facility # 1	Retrofit	2.5	0.56	ST	1.00	15.3	8.5680	35%	2.9945	1.69	0.9464	55%	0.5198	0.44	0.2464	70%	0.1722
Hickory Ridge	Retrofit	23.75	4.8	ST	2.50	15.3	73.4400	39%	28.8729	1.69	8.1120	62%	5.0292	0.44	2.1120	79%	1.6645
Bateman SW Pond	Facility	47.25	4.52	ST	2.50	15.3	69.1560	39%	27.1887	1.69	7.6388	62%	4.7358	0.44	1.9888	79%	1.5674
Marriot Wood 1 Facility # 2	Retrofit	7.12	2.04	ST	2.50	15.3	31.2120	39%	12.2710	1.69	3.4476	62%	2.1374	0.44	0.8976	79%	0.7074
Marriot Wood II	Retrofit	7.51	1.38	ST	2.50	15.3	21.1140	39%	8.3010	1.69	2.3322	62%	1.4459	0.44	0.6072	79%	0.4785
Elderwood Village	Retrofit	7.64	2.47	ST	2.50	15.3	37.7910	39%	14.8575	1.69	4.1743	62%	2.5879	0.44	1.0868	79%	0.8565
Westminster Airport Pond	Retrofit	204.84	85	ST	1.40	15.3	1300.5000	38%	489.0375	1.69	143.6500	59%	84.8894	0.44	37.4000	75%	28.1282
Oklahoma II Foothills	Retrofit	23.72	6.06	ST	2.35	15.3	92.7180	39%	36.3301	1.69	10.2414	62%	6.3218	0.44	2.6664	78%	2.0930
Oklahoma Phase I	Retrofit	24.44	7.27	ST	2.50	15.3	111.2310	39%	43.7305	1.69	12.2863	62%	7.6172	0.44	3.1988	79%	2.5210
Edgewood	Retrofit	38	12.12	ST	2.50	15.3	185.4360	39%	72.9042	1.69	20.4828	62%	12.6988	0.44	5.3328	79%	4.2029
Upper Patapsco Phase 1	Facility	24.6	10.1	ST	2.50	15.3	154.5300	39%	60.7535	1.69	17.0690	62%	10.5823	0.44	4.4440	79%	3.5024
Upper Patapsco Phase 2	Facility	101.8	2.98	ST	2.50	15.3	45.5940	39%	17.9253	1.69	5.0362	62%	3.1223	0.44	1.3112	79%	1.0334
Quail Meadowns	Retrofit	111.97	23.25	ST	1.00	15.3	355.7250	35%	124.3259	1.69	39.2925	55%	21.5794	0.44	10.2300	70%	7.1508
Heritage Heights	Retrofit	21.38	4.1	ST	1.00	15.3	62.7300	35%	21.9241	1.69	6.9290	55%	3.8054	0.44	1.8040	70%	1.2610
Westminster High School	Retrofit	117.25	32.59	ST	2.50	15.3	498.6270	39%	196.0352	1.69	55.0771	62%	34.1463	0.44	14.3396	79%	11.3013
Westminster Comm. Pond	Facility	250.22	63.89	ST	2.50	15.3	977.5170	39%	384.3108	1.69	107.9741	62%	66.9409	0.44	28.1116	79%	22.1553
Diamond Hills Section 5	Retrofit	51.8	12.94	ST	2.03	15.3	197.9820	39%	77.3732	1.69	21.8686	61%	13.4445	0.44	5.6936	78%	4.4534
Wilda Drive	Facility	6.75	1.6	ST	1.07	15.3	24.4800	36%	8.7093	1.69	2.7040	56%	1.5117	0.44	0.7040	71%	0.5009
Collins Estates	Retrofit	16.34	3.18	ST	1.87	15.3	48.6540	39%	18.9371	1.69	5.3742	61%	3.2891	0.44	1.3992	78%	1.0896
High Point	Retrofit	4.7	0.91	ST	1.00	15.3	13.9230	35%	4.8661	1.69	1.5379	55%	0.8446	0.44	0.4004	70%	0.2799
Willow Pond	Retrofit	601	72.75	ST	2.50	15.3	1113.0750	39%	437.6054	1.69	122.9475	62%	76.2240	0.44	32.0100	79%	25.2277
Finksburg Industrial Park	Retrofit	67.8	22.12	ST	1.04	15.3	338.4360	35%	119.5339	1.69	37.3828	56%	20.7477	0.44	9.7328	71%	6.8751
Elderwood/ Village Parcel oklahoma 4	Retrofit	144	82.68	ST	1.38	15.3	1265.0040	38%	474.5479	1.69	139.7292	59%	82.3734	0.44	36.3792	75%	27.2946
Miller/Watts	Retrofit	39.65	25.63	ST	2.50	15.3	392.1390	39%	154.1694	1.69	43.3147	62%	26.8539	0.44	11.2772	79%	8.8878
Central MD (Wet)	Retrofit	92.72	25.83	ST	2.50	15.3	395.1990	39%	155.3725	1.69	43.6527	62%	27.0634	0.44	11.3652	79%	8.9571
Randomhouse	Retrofit	41.8	16.38	ST	2.50	16.3	266.9940	39%	104.9687	2.69	44.0622	62%	27.3173	1.44	23.5872	79%	18.5895

Stormwater Facility Pervious Treatment– Liberty Watershed

Project	Project Type	Drainage Area (Ac)	Pervious Area (Ac)	Practice Type	Runoff depth treated (In.)	TN Pollutant Runoff Load	Total Loads (lbs)	TN BMP Efficiency (%)	TN Pollutant Loads Reduced (lbs)	TP Pollutant Load	Total Loads (lbs)	TP BMP Efficiency	TP Pollutant Loads Reduced (lbs)	TSS Pollutant Load	Total Loads (tons)	TSS BMP Efficiency	TSS Pollutant Loads Reduced (Tons)
Marriot Wood 1 Facility # 1	Retrofit	2.5	1.94	ST	1.00	10.8	20.9520	35%	7.3227	0.43	0.8342	55%	0.4581	0.07	0.1358	70%	0.0949
Hickory Ridge	Retrofit	23.75	18.95	ST	2.50	10.8	204.6600	39%	80.4621	0.43	8.1485	62%	5.0518	0.07	1.3265	79%	1.0454
Bateman SW Pond	Facility	47.25	42.73	ST	2.50	10.8	461.4840	39%	181.4324	0.43	18.3739	62%	11.3913	0.07	2.9911	79%	2.3573
Marriot Wood 1 Facility # 2	Retrofit	7.12	5.08	ST	2.50	10.8	54.8640	39%	21.5698	0.43	2.1844	62%	1.3543	0.07	0.3556	79%	0.2803
Marriot Wood II	Retrofit	7.51	6.13	ST	2.50	10.8	66.2040	39%	26.0281	0.43	2.6359	62%	1.6342	0.07	0.4291	79%	0.3382
Elderwood Village	Retrofit	7.64	5.17	ST	2.50	10.8	55.8360	39%	21.9519	0.43	2.2231	62%	1.3783	0.07	0.3619	79%	0.2852
Westminster Airport Pond	Retrofit	204.84	119.84	ST	1.40	10.8	1294.2720	38%	486.6955	0.43	51.5312	59%	30.4521	0.07	8.3888	75%	6.3091
Oklahoma II Foothills	Retrofit	23.72	17.66	ST	2.35	10.8	190.7280	39%	74.7337	0.43	7.5938	62%	4.6875	0.07	1.2362	78%	0.9704
Oklahoma Phase I	Retrofit	24.44	17.17	ST	2.50	10.8	185.4360	39%	72.9042	0.43	7.3831	62%	4.5773	0.07	1.2019	79%	0.9472
Edgewood	Retrofit	38	25.88	ST	2.50	10.8	279.5040	39%	109.8870	0.43	11.1284	62%	6.8993	0.07	1.8116	79%	1.4278
Upper Patapsco Phase 1	Facility	24.6	14.5	ST	2.50	10.8	156.6000	39%	61.5673	0.43	6.2350	62%	3.8655	0.07	1.0150	79%	0.7999
Upper Patapsco Phase 2	Facility	101.8	98.82	ST	2.50	10.8	1067.2560	39%	419.5917	0.43	42.4926	62%	26.3442	0.07	6.9174	79%	5.4517
Quail Meadowns	Retrofit	111.97	88.72	ST	1.00	10.8	958.1760	35%	334.8825	0.43	38.1496	55%	20.9518	0.07	6.2104	70%	4.3411
Heritage Heights	Retrofit	21.38	17.28	ST	1.00	10.8	186.6240	35%	65.2251	0.43	7.4304	55%	4.0808	0.07	1.2096	70%	0.8455
Westminster High School	Retrofit	117.25	84.66	ST	2.50	10.8	914.3280	39%	359.4681	0.43	36.4038	62%	22.5693	0.07	5.9262	79%	4.6705
Westminster Comm. Pond	Facility	250.22	186.33	ST	2.50	10.8	2012.3640	39%	791.1609	0.43	80.1219	62%	49.6733	0.07	13.0431	79%	10.2795
Diamond Hills Section 5	Retrofit	51.8	38.86	ST	2.03	10.8	419.6880	39%	164.0180	0.43	16.7098	61%	10.2730	0.07	2.7202	78%	2.1277
Wilda Drive	Facility	6.75	5.15	ST	1.07	10.8	55.6200	36%	19.7880	0.43	2.2145	56%	1.2380	0.07	0.3605	71%	0.2565
Collins Estates	Retrofit	16.34	13.16	ST	1.87	10.8	142.1280	39%	55.3190	0.43	5.6588	61%	3.4633	0.07	0.9212	78%	0.7174
High Point	Retrofit	4.7	3.79	ST	1.00	10.8	40.9320	35%	14.3057	0.43	1.6297	55%	0.8950	0.07	0.2653	70%	0.1854
Willow Pond	Retrofit	601	528.25	ST	2.50	10.8	5705.1000	39%	2242.9601	0.43	227.1475	62%	140.8251	0.07	36.9775	79%	29.1427
Finksburg Industrial Park	Retrofit	67.8	45.68	ST	1.04	10.8	493.3440	35%	174.2466	0.43	19.6424	56%	10.9016	0.07	3.1976	71%	2.2587
Elderwood/ oklahoma 4	Retrofit	144	61.32	ST	1.38	10.8	662.2560	38%	248.4357	0.43	26.3676	59%	15.5443	0.07	4.2924	75%	3.2205
Miller/Watts	Retrofit	39.65	14.02	ST	2.50	10.8	151.4160	39%	59.5292	0.43	6.0286	62%	3.7376	0.07	0.9814	79%	0.7735
Central MD (Wet)	Retrofit	92.72	66.89	ST	2.50	10.8	722.4120	39%	284.0163	0.43	28.7627	62%	17.8321	0.07	4.6823	79%	3.6902
Randomhouse	Retrofit	41.8	25.42	RR	2.50	10.8	274.5360	39%	107.9338	0.43	10.9306	62%	6.7767	0.07	1.7794	79%	1.4024

Chesapeake Bay TMDL Edge-of-Stream Load Reduction Calculations

Double Pipe Creek Watershed

Stormwater Facility Impervious Treatment– Double Pipe Creek Watershed

Project	Project Type	Drainage Area (Ac)	Impervious Area (Acres)	Practice Type	Runoff depth treated (In.)	TN Pollutant Runoff Load	Total Loads (lbs)	TN BMP Efficiency (%)	TN Pollutant Loads Reduced (lbs)	TP Pollutant Load	Total Loads (lbs)	TP BMP Efficiency	TP Pollutant Loads Reduced (lbs)	TSS Pollutant Load	Total Loads (tons)	TSS BMP Efficiency	TSS Pollutant Loads Reduced (Tons)
Sunnyside	Facility	30.2	2.69	ST	1.91	15.3	41.1570	39%	16.0402	1.69	4.5461	61%	2.7862	0.44	1.1836	78%	0.9230
Friendship Overlook	Retrofit	82.01	15.88	ST	1.68	15.3	242.9640	39%	93.6804	1.69	26.8372	61%	16.2656	0.44	6.9872	77%	5.3891
Farm Museum	Facility	6.44	0.45	RR	1.40	15.3	6.8850	64%	4.4280	1.69	0.7605	75%	0.5720	0.44	0.1980	81%	0.1597
Farm Museum 1	Facility	11.61	2.3	RR	1.44	15.3	35.1900	65%	22.7374	1.69	3.8870	76%	2.9367	0.44	1.0120	81%	0.8198
Farm Museum 2	Facility	0.09	0.05	RR	1.00	15.3	0.7650	60%	0.4571	1.69	0.0845	70%	0.0591	0.44	0.0220	75%	0.0165
Farm Museum 3	Facility	0.79	0.06	RR	1.00	15.3	0.9180	60%	0.5485	1.69	0.1014	70%	0.0709	0.44	0.0264	75%	0.0198
Farm Museum 4	Facility	0.03	0.03	RR	1.00	15.3	0.4590	60%	0.2743	1.69	0.0507	70%	0.0354	0.44	0.0132	75%	0.0099
Farm Museum 5	Facility	0.01	0.01	RR	1.00	15.3	0.1530	60%	0.0914	1.69	0.0169	70%	0.0118	0.44	0.0044	75%	0.0033
CC Maintenance	Retrofit	45.49	25.05	ST	2.50	15.3	383.2650	39%	150.6806	1.69	42.3345	62%	26.2462	0.44	11.0220	79%	8.6866
Blue Ridge Manor	Retrofit	36.28	9.26	RR	1.86	15.3	141.6780	67%	94.3535	1.69	15.6494	78%	12.1825	0.44	4.0744	84%	3.4041
Exceptional Center	Retrofit	46.5	14.7	ST	1.51	15.3	224.9100	38%	85.5642	1.69	24.8430	60%	14.8537	0.44	6.4680	76%	4.9216

Stormwater Facility Pervious Treatment– Double Pipe Creek Watershed

Project	Project Type	Drainage Area (Ac)	Pervious Area (Ac)	Practice Type	Runoff depth treated (In.)	TN Pollutant Runoff Load	Total Loads (lbs)	TN BMP Efficiency (%)	TN Pollutant Loads Reduced (lbs)	TP Pollutant Load	Total Loads (lbs)	TP BMP Efficiency	TP Pollutant Loads Reduced (lbs)	TSS Pollutant Load	Total Loads (tons)	TSS BMP Efficiency	TSS Pollutant Loads Reduced (Tons)
Sunnyside	Facility	30.2	27.51	ST	1.91	10.8	297.1080	39%	115.7926	0.43	11.8293	61%	7.2500	0.07	1.9257	78%	1.5017
Friendship Overlook	Retrofit	82.01	66.13	ST	1.68	10.8	714.2040	39%	275.3779	0.43	28.4359	61%	17.2345	0.07	4.6291	77%	3.5704
Farm Museum	Facility	6.44	5.99	RR	1.40	10.8	64.6920	64%	41.6061	0.43	2.5757	75%	1.9372	0.07	0.4193	81%	0.3381
Farm Museum 1	Facility	11.61	9.31	RR	1.44	10.8	100.5480	65%	64.9674	0.43	4.0033	76%	3.0246	0.07	0.6517	81%	0.5279
Farm Museum 2	Facility	0.09	0.04	RR	1.00	10.8	0.4320	60%	0.2581	0.43	0.0172	70%	0.0120	0.07	0.0028	75%	0.0021
Farm Museum 3	Facility	0.79	0.73	RR	1.00	10.8	7.8840	60%	4.7107	0.43	0.3139	70%	0.2194	0.07	0.0511	75%	0.0383
Farm Museum 4	Facility	0.03	0	RR	1.00	10.8	0.0000	60%	0.0000	0.43	0.0000	70%	0.0000	0.07	0.0000	75%	0.0000
Farm Museum 5	Facility	0.01	0	RR	1.00	10.8	0.0000	60%	0.0000	0.43	0.0000	70%	0.0000	0.07	0.0000	75%	0.0000
CC Maintenance	Retrofit	45.49	20.44	ST	2.50	10.8	220.7520	39%	86.7886	0.43	8.7892	62%	5.4491	0.07	1.4308	79%	1.1276
Blue Ridge Manor	Retrofit	36.28	27.02	RR	1.86	10.8	291.8160	67%	194.3412	0.43	11.6186	78%	9.0447	0.07	1.8914	84%	1.5802
Exceptional Center	Retrofit	46.5	31.8	ST	1.51	10.8	343.4400	38%	130.6575	0.43	13.6740	60%	8.1757	0.07	2.2260	76%	1.6938

Streambank Regeneration – Double Pipe Creek Watershed

Location	Linear Feet	TN lbs reduced/linear ft	TN Pollutant Loads Reduced (lbs)	TP lbs reduced/linear ft	TP Pollutant Loads Reduced (lbs)	TSS lbs reduced/linear ft	TSS Pollutant Loads Reduced (lbs)	TSS Pollutant Loads Reduced (Tons)
Blue Ridge Manor	220	0.075	16.500	0.068	14.960	44.8	9856	4.928
		Total:	**16.5000**		**14.9600**		**9,856**	**4.928**

Buffer Plantings – Double Pipe Creek Watershed

Stream Buffer Plantings

Project	Acres	TN Pollutant Load	Total Loads (lbs)	TN BMP Efficiency (%)	TN Pollutant Loads Reduced (lbs)	TP Pollutant Load	Total Loads (lbs)	TP BMP Efficiency	TP Pollutant Loads Reduced (lbs)	TSS Pollutant Load	Total Loads (tons)	TSS BMP Efficiency	TSS Pollutant Loads Reduced (Tons)
Planting 1	4.13	10.8	44.6040	66	29.4386	0.43	1.7759	77	1.3674	0.07	0.2891	57	0.1648
Planting 2	10.85	10.8	117.1800	66	77.3388	0.43	4.6655	77	3.5924	0.07	0.7595	57	0.4329
Planting 3	0.2	10.8	2.1600	66	1.4256	0.43	0.0860	77	0.0662	0.07	0.0140	57	0.0080
Planting 4	1.4	10.8	15.1200	66	9.9792	0.43	0.6020	77	0.4635	0.07	0.0980	57	0.0559
Planting 5	0.5	10.8	5.4000	66	3.5640	0.43	0.2150	77	0.1656	0.07	0.0350	57	0.0200
Planting 6	0.3	10.8	3.2400	66	2.1384	0.43	0.1290	77	0.0993	0.07	0.0210	57	0.0120
Planting 7	0.65	10.8	7.0200	66	4.6332	0.43	0.2795	77	0.2152	0.07	0.0455	57	0.0259
Planting 8	2.3	10.8	24.8400	66	16.3944	0.43	0.9890	77	0.7615	0.07	0.1610	57	0.0918
Planting 9	0.4	10.8	4.3200	66	2.8512	0.43	0.1720	77	0.1324	0.07	0.0280	57	0.0160
Planting 10	2.25	10.8	24.3000	66	16.0380	0.43	0.9675	77	0.7450	0.07	0.1575	57	0.0898
Planting 11	0.2	10.8	2.1600	66	1.4256	0.43	0.0860	77	0.0662	0.07	0.0140	57	0.0080
Planting 12	0.62	10.8	6.6960	66	4.4194	0.43	0.2666	77	0.2053	0.07	0.0434	57	0.0247
Planting 13	1.8	10.8	19.4400	66	12.8304	0.43	0.7740	77	0.5960	0.07	0.1260	57	0.0718
Planting 14	0.9	10.8	9.7200	66	6.4152	0.43	0.3870	77	0.2980	0.07	0.0630	57	0.0359
Planting 15	0.26	10.8	2.8080	66	1.8533	0.43	0.1118	77	0.0861	0.07	0.0182	57	0.0104
Planting 16	3	10.8	32.4000	66	21.3840	0.43	1.2900	77	0.9933	0.07	0.2100	57	0.1197
Planting 17	9	10.8	97.2000	66	64.1520	0.43	3.8700	77	2.9799	0.07	0.6300	57	0.3591
Planting 18	0.13	10.8	1.4040	66	0.9266	0.43	0.0559	77	0.0430	0.07	0.0091	57	0.0052
Planting 19	0.6	10.8	6.4800	66	4.2768	0.43	0.2580	77	0.1987	0.07	0.0420	57	0.0239
Planting 20	0.2	10.8	2.1600	66	1.4256	0.43	0.0860	77	0.0662	0.07	0.0140	57	0.0080
Planting 21	1.25	10.8	13.5000	66	8.9100	0.43	0.5375	77	0.4139	0.07	0.0875	57	0.0499
Planting 22	0.45	10.8	4.8600	66	3.2076	0.43	0.1935	77	0.1490	0.07	0.0315	57	0.0180
Planting 23	2.2	10.8	23.7600	66	15.6816	0.43	0.9460	77	0.7284	0.07	0.1540	57	0.0878
Planting 24	1.62	10.8	17.4960	66	11.5474	0.43	0.6966	77	0.5364	0.07	0.1134	57	0.0646
Planting 25	4.26	10.8	46.0080	66	30.3653	0.43	1.8318	77	1.4105	0.07	0.2982	57	0.1700
Planting 26	1.8	10.8	19.4400	66	12.8304	0.43	0.7740	77	0.5960	0.07	0.1260	57	0.0718
Planting 27	2.05	10.8	22.1400	66	14.6124	0.43	0.8815	77	0.6788	0.07	0.1435	57	0.0818
Planting 28	0.59	10.8	6.3720	66	4.2055	0.43	0.2537	77	0.1953	0.07	0.0413	57	0.0235
Planting 29	0.44	10.8	4.7520	66	3.1363	0.43	0.1892	77	0.1457	0.07	0.0308	57	0.0176
Planting 30	0.17	10.8	1.8360	66	1.2118	0.43	0.0731	77	0.0563	0.07	0.0119	57	0.0068
Planting 31	0.22	10.8	2.3760	66	1.5682	0.43	0.0946	77	0.0728	0.07	0.0154	57	0.0088
Total:	**54.74**		**591.1920**		**390.1867**		**23.5382**		**18.1244**		**3.8318**		**2.1841**

Catch Basin/Inlet Cleaning– Double Pipe Creek Watershed

Location	Tons	TN lbs reduced/ton	TN Pollutant Loads Reduced (lbs)	TP lbs reduced/ton	TP Pollutant Loads Reduced (lbs)	TSS lbs reduced/ton	TSS Pollutant Loads Reduced (lbs)	TSS Pollutant Loads Reduced (Tons)
Manchester	3.04	3.5	10.640	1.4	4.256	420	1276.8	0.638
New Windsor	0.91	3.5	3.185	1.4	1.274	420	382.2	0.191
Union Bridge	1.37	3.5	4.795	1.4	1.918	420	575.4	0.288
County	0.5	3.5	1.750	1.4	0.700	420	210	0.105
Westminster	0.23	3.5	0.805	1.4	0.322	420	96.6	0.048
		Total:	**21.1750**		**8.4700**		**2,541**	**1.271**

Street Sweeping– Double Pipe Creek Watershed

Location	Acres	TN Pollutant Load	Total Loads (lbs)	TN BMP Efficiency (%)	TN Pollutant Loads Reduced (lbs)	TP Pollutant Load	Total Loads (lbs)	TP BMP Efficiency	TP Pollutant Loads Reduced (lbs)	TSS Pollutant Load (tons/ac)	Total Loads (tons)	TSS BMP Efficiency	TSS Pollutant Loads Reduced (Tons)
Westminster	7.62	11.7	89.154	4	3.56616	0.68	5.1816	4	0.207264	0.18	1.3716	10	0.13716
		Total:	**89.1540**		**3.5662**		**5.1816**		**0.2073**		**1.3716**		**0.1372**

Water Resource Easements– Double Pipe Creek Watershed

Subdivision	Acres	Recorded Date	TN Pollutant Load	Total Loads (lbs)	TN BMP Efficiency (%)	TN Pollutant Loads Reduced (lbs)	TP Pollutant Load	Total Loads (lbs)	TP BMP Efficiency	TP Pollutant Loads Reduced (lbs)	TSS Pollutant Load	Total Loads (tons)	TSS BMP Efficiency	TSS Pollutant Loads Reduced (Tons)
Ellen's Dilemma	0.695	8/25/2000	11.7	8.1365	30	2.44096	0.68	0.4729	40	0.1892	0.18	0.1252	55	0.0688
Catoctin Summit 2	0.016	1/25/2001	11.7	0.1872	30	0.05616	0.68	0.0109	40	0.0044	0.18	0.0029	55	0.0016
Sun Valley, Section 2	0.013	6/4/2001	11.7	0.1521	30	0.04563	0.68	0.0088	40	0.0035	0.18	0.0023	55	0.0013
Coventry at Westminster	0.344	11/30/2001	11.7	4.0248	30	1.20744	0.68	0.2339	40	0.0936	0.18	0.0619	55	0.0341
New Beginnings	4.303	5/16/2002	11.7	50.3481	30	15.10444	0.68	2.9262	40	1.1705	0.18	0.7746	55	0.4260
Doves Crest	0.484	4/22/2003	11.7	5.6628	30	1.69884	0.68	0.3291	40	0.1316	0.18	0.0871	55	0.0479
Greenwood Overlook	2.233	1/25/2005	11.7	26.1235	30	7.83706	0.68	1.5183	40	0.6073	0.18	0.4019	55	0.2210
Snavely Forest	9.530	4/12/2005	11.7	111.5010	30	33.45030	0.68	6.4804	40	2.5922	0.18	1.7154	55	0.9435
Naomi's Delight, Section 4	4.998	5/4/2005	11.7	58.4798	30	17.54395	0.68	3.3988	40	1.3595	0.18	0.8997	55	0.4948
Camelot Plaza, Section One	0.445	6/17/2005	11.7	5.2065	30	1.56195	0.68	0.3026	40	0.1210	0.18	0.0801	55	0.0441
Brilhart Property	0.437	7/8/2005	11.7	5.1128	30	1.53383	0.68	0.2972	40	0.1189	0.18	0.0787	55	0.0433
Stone's Throw	0.495	7/14/2005	11.7	5.7915	30	1.73745	0.68	0.3366	40	0.1346	0.18	0.0891	55	0.0490
Heather's Land	1.150	11/3/2005	11.7	13.4528	30	4.03583	0.68	0.7819	40	0.3127	0.18	0.2070	55	0.1138
Schatzies Choice	0.707	12/15/2005	11.7	8.2757	30	2.48270	0.68	0.4810	40	0.1924	0.18	0.1273	55	0.0700
Walgarmyr	3.992	12/22/2005	11.7	46.7064	30	14.01192	0.68	2.7146	40	1.0858	0.18	0.7186	55	0.3952
Hoke Property, 2nd Off Conveyance	10.641	5/22/2006	11.7	124.4997	30	37.34991	0.68	7.2359	40	2.8944	0.18	1.9154	55	1.0535
Burleson Property	0.287	9/12/2006	11.7	3.3530	30	1.00590	0.68	0.1949	40	0.0780	0.18	0.0516	55	0.0284
Bowling Brook	20.341	10/2/2006	11.7	237.9897	30	71.39691	0.68	13.8319	40	5.5328	0.18	3.6614	55	2.0138
Westvale	0.419	11/21/2006	11.7	4.8995	30	1.46984	0.68	0.2848	40	0.1139	0.18	0.0754	55	0.0415
Spring Meadow, Amended Plat Tract 1	0.591	1/23/2007	11.7	6.9132	30	2.07396	0.68	0.4018	40	0.1607	0.18	0.1064	55	0.0585
Sterling Ridge Estates	1.454	11/15/2007	11.7	17.0176	30	5.10527	0.68	0.9891	40	0.3956	0.18	0.2618	55	0.1440
Dutchmans' Bluff	4.463	2/28/2008	11.7	52.2171	30	15.66513	0.68	3.0348	40	1.2139	0.18	0.8033	55	0.4418
Key Estates	0.368	6/5/2008	11.7	4.3056	30	1.29168	0.68	0.2502	40	0.1001	0.18	0.0662	55	0.0364
Johnson Property	0.407	6/5/2008	11.7	4.7574	30	1.42723	0.68	0.2765	40	0.1106	0.18	0.0732	55	0.0403
Lehigh Cement Company	56.861	9/17/2008	11.7	665.2737	30	199.58211	0.68	38.6655	40	15.4662	0.18	10.2350	55	5.6292
Bark Hill Park	0.111	11/4/2008	11.7	1.2987	30	0.38961	0.68	0.0755	40	0.0302	0.18	0.0200	55	0.0110
Bixler Property Hangover Parcel	3.268	9/16/2009	11.7	38.2340	30	11.47020	0.68	2.2221	40	0.8889	0.18	0.5882	55	0.3235
Greenvale Mews	2.473	3/5/2010	11.7	28.9341	30	8.68023	0.68	1.6816	40	0.6727	0.18	0.4451	55	0.2448
Krom's Keep	0.007	3/9/2010	11.7	0.0819	30	0.02457	0.68	0.0048	40	0.0019	0.18	0.0013	55	0.0007
Watts Property	1.059	4/12/2010	11.7	12.3960	30	3.71881	0.68	0.7205	40	0.2882	0.18	0.1907	55	0.1049
Big Pipe Overlook	0.318	4/16/2010	11.7	3.7249	30	1.11748	0.68	0.2165	40	0.0866	0.18	0.0573	55	0.0315
Cox Hillside	0.117	4/22/2010	11.7	1.3689	30	0.41067	0.68	0.0796	40	0.0318	0.18	0.0211	55	0.0116
Drifting Snow	0.810	6/2/2010	11.7	9.4750	30	2.84249	0.68	0.5507	40	0.2203	0.18	0.1458	55	0.0802
Dachille Property	2.518	6/25/2010	11.7	29.4603	30	8.83808	0.68	1.7122	40	0.6849	0.18	0.4532	55	0.2493
Carroll County Public Transportation Building	8.802	12/10/2010	11.7	102.9834	30	30.89502	0.68	5.9854	40	2.3941	0.18	1.5844	55	0.8714
Nadine's Overlook	2.032	6/3/2011	11.7	23.7744	30	7.13232	0.68	1.3818	40	0.5527	0.18	0.3658	55	0.2012
Father's Care, LLC Property	1.909	6/9/2011	11.7	22.3363	30	6.70088	0.68	1.2982	40	0.5193	0.18	0.3436	55	0.1890
Bedford Falls Farm	3.717	8/1/2011	11.7	43.4889	30	13.04667	0.68	2.5276	40	1.0110	0.18	0.6691	55	0.3680
Jordans Crossing	1.365	1/5/2012	11.7	15.9662	30	4.78986	0.68	0.9280	40	0.3712	0.18	0.2456	55	0.1351
Jacobs Ridge 2	0.010	7/26/2012	11.7	0.1170	30	0.03510	0.68	0.0068	40	0.0027	0.18	0.0018	55	0.0010
Jacob's Ridge 3	0.398	11/9/2012	11.7	4.6566	30	1.39698	0.68	0.2706	40	0.1083	0.18	0.0716	55	0.0394
Vista Green	0.448	9/16/2014	11.7	5.2416	30	1.57248	0.68	0.3046	40	0.1219	0.18	0.0806	55	0.0444
Was-Mere Acres	2.811	1/5/2015	11.7	32.8887	30	9.86661	0.68	1.9115	40	0.7646	0.18	0.5060	55	0.2783
Lehigh New Windsor Quarry	13.211	2/25/2015	11.7	154.5635	30	46.36905	0.68	8.9832	40	3.5933	0.18	2.3779	55	1.3078
Richardson Property	1.127	10/12/2016	11.7	13.1859	30	3.95577	0.68	0.7664	40	0.3065	0.18	0.2029	55	0.1116
Medford Quarry Amended	9.217	3/30/2017	11.7	107.8389	30	32.35167	0.68	6.2676	40	2.5070	0.18	1.6591	55	0.9125
McNemar Property OC #1	0.905	4/20/2017	11.7	10.5885	30	3.17655	0.68	0.6154	40	0.2462	0.18	0.1629	55	0.0896
	182.307		Total:	2132.9917		639.89750		38.4348		15.3739		32.8153		18.0484

- The Double Pipe Creek Watershed has varying baseline years for local TMDLs. The red indicates that particular BMP was not included in the reduction for that individual pollutant as the date implemented was prior to the baseline year.

Floodplain Protection Easements – Double Pipe Creek Watershed

Subdivision	Acres	Recorded Date	TN Pollutant Load	Total Loads (lbs)	TN BMP Efficiency (%)	TN Pollutant Loads Reduced (lbs)	TP Pollutant Load	Total Loads (lbs)	TP BMP Efficiency	TP Pollutant Loads Reduced (lbs) ✚	TSS Pollutant Load	Total Loads (tons)	TSS BMP Efficiency	TSS Pollutant Loads Reduced (Tons)
Doves Crest	0.637	4/9/2003	11.7	7.4529	30	2.2359	0.68	0.4332	40	0.1733	0.18	0.1147	55	0.0631
Greenwood Overlook	0.022	12/20/2004	11.7	0.2595	30	0.0779	0.68	0.0151	40	0.0060	0.18	0.0040	55	0.0022
Sunny View Acres	0.063	1/14/2005	11.7	0.7326	30	0.2198	0.68	0.0426	40	0.0170	0.18	0.0113	55	0.0062
Snavely Forest	0.014	4/11/2005	11.7	0.1638	30	0.0491	0.68	0.0095	40	0.0038	0.18	0.0025	55	0.0014
Naomi's Delight	0.242	4/28/2005	11.7	2.8268	30	0.8480	0.68	0.1643	40	0.0657	0.18	0.0435	55	0.0239
Brilhart Property	0.227	6/16/2005	11.7	2.6605	30	0.7981	0.68	0.1546	40	0.0619	0.18	0.0409	55	0.0225
Camelot Plaza	6.467	6/17/2005	11.7	75.6639	30	22.6992	0.68	4.3976	40	1.7590	0.18	1.1641	55	0.6402
Stone's Throw, Section 2	2.132	6/23/2005	11.7	24.9444	30	7.4833	0.68	1.4498	40	0.5799	0.18	0.3838	55	0.2111
Heather's Land	0.002	11/3/2005	11.7	0.0282	30	0.0085	0.68	0.0016	40	0.0007	0.18	0.0004	55	0.0002
Walgarmyr, Section 2	0.157	12/22/2005	11.7	1.8369	30	0.5511	0.68	0.1068	40	0.0427	0.18	0.0283	55	0.0155
Hoke Property, OC #2	3.246	5/31/2006	11.7	37.9783	30	11.3935	0.68	2.2073	40	0.8829	0.18	0.5843	55	0.3214
Bowling Brook	0.635	10/2/2006	11.7	7.4295	30	2.2289	0.68	0.4318	40	0.1727	0.18	0.1143	55	0.0629
Arters Mill Estates	1.124	11/30/2006	11.7	13.1550	30	3.9465	0.68	0.7646	40	0.3058	0.18	0.2024	55	0.1113
Sterling Ridge Estates	0.003	11/15/2007	11.7	0.0301	30	0.0090	0.68	0.0017	40	0.0007	0.18	0.0005	55	0.0003
Dutchmans' Bluff	4.650	2/28/2008	11.7	54.4050	30	16.3215	0.68	3.1620	40	1.2648	0.18	0.8370	55	0.4604
Lehigh Cement Company	24.398	9/17/2008	11.7	285.4566	30	85.6370	0.68	16.5906	40	6.6363	0.18	4.3916	55	2.4154
Uniontown Bible Church	9.775	10/14/2008	11.7	114.3675	30	34.3103	0.68	6.6470	40	2.6588	0.18	1.7595	55	0.9677
Schatzie's Choice, Section 2	0.047	8/18/2009	11.7	0.5495	30	0.1648	0.68	0.0319	40	0.0128	0.18	0.0085	55	0.0046
Silver Run Estates - Lot 1	0.802	8/21/2009	11.7	9.3863	30	2.8159	0.68	0.5455	40	0.2182	0.18	0.1444	55	0.0794
Greenvale Mews	0.633	3/2/2010	11.7	7.4061	30	2.2218	0.68	0.4304	40	0.1722	0.18	0.1139	55	0.0627
Krom's Keep	0.000	3/3/2010	11.7	0.0000	30	0.0000	0.68	0.0000	40	0.0000	0.18	0.0000	55	0.0000
Bixler Hangover Parcel	0.039	4/4/2010	11.7	0.4563	30	0.1369	0.68	0.0265	40	0.0106	0.18	0.0070	55	0.0039
Cox Hillside	0.043	4/22/2010	11.7	0.5031	30	0.1509	0.68	0.0292	40	0.0117	0.18	0.0077	55	0.0043
Drifting Snow	0.068	5/25/2010	11.7	0.7902	30	0.2371	0.68	0.0459	40	0.0184	0.18	0.0122	55	0.0067
Nadine's Overlook	0.749	6/3/2011	11.7	8.7633	30	2.6290	0.68	0.5093	40	0.2037	0.18	0.1348	55	0.0742
Father's Care, LLC Property	0.411	6/9/2011	11.7	4.8094	30	1.4428	0.68	0.2795	40	0.1118	0.18	0.0740	55	0.0407
Bedford Falls Farm	0.209	8/1/2011	11.7	2.4453	30	0.7336	0.68	0.1421	40	0.0568	0.18	0.0376	55	0.0207
Jordans Crossing	0.023	1/5/2012	11.7	0.2691	30	0.0807	0.68	0.0156	40	0.0063	0.18	0.0041	55	0.0023
Jacob's Ridge 2	0.001	7/26/2012	11.7	0.0117	30	0.0035	0.68	0.0007	40	0.0003	0.18	0.0002	55	0.0001
Jacob's Ridge 3	0.005	11/9/2012	11.7	0.0613	30	0.0184	0.68	0.0036	40	0.0014	0.18	0.0009	55	0.0005
Was-Mere Acres	5.784	3/24/2015	11.7	67.6728	30	20.3018	0.68	3.9331	40	1.5732	0.18	1.0411	55	0.5726
	62.608		**Total:**	**732.5159**		**219.7548**		**5.9936**		**2.3974**		**11.2695**		**6.1982**

✚The Double Pipe Creek Watershed has varying baseline years for local TMDLs. The red indicates that particular BMP was not included in the reduction for that individual pollutant as the date implemented was prior to the baseline year.

Chesapeake Bay TMDL Edge-of-Stream Load Reduction Calculations

South Branch Patapsco Watershed

Buffer Plantings – South Branch Patapsco Watershed

Project	Acres	TN Pollutant Load	Total Loads (lbs)	TN BMP Efficiency (%)	TN Pollutant Loads Reduced (lbs)	TP Pollutant Load	Total Loads (lbs)	TP BMP Efficiency	TP Pollutant Loads Reduced (lbs)	TSS Pollutant Load	Total Loads (tons)	TSS BMP Efficiency	TSS Pollutant Loads Reduced (Tons)
Planting 1	5.6	10.8	60.4800	66	39.9168	0.43	2.4080	77	1.8542	0.07	0.3920	57	0.2234
Planting 2	3.45	10.8	37.2600	66	24.5916	0.43	1.4835	77	1.1423	0.07	0.2415	57	0.1377
Planting 3	0.16	10.8	1.7280	66	1.1405	0.43	0.0688	77	0.0530	0.07	0.0112	57	0.0064
Planting 4	3.2	10.8	34.5600	66	22.8096	0.43	1.3760	77	1.0595	0.07	0.2240	57	0.1277
Planting 5	0.3	10.8	3.2400	66	2.1384	0.43	0.1290	77	0.0993	0.07	0.0210	57	0.0120
Planting 6	3	10.8	32.4000	66	21.3840	0.43	1.2900	77	0.9933	0.07	0.2100	57	0.1197
Planting 7	0.23	10.8	2.4840	66	1.6394	0.43	0.0989	77	0.0762	0.07	0.0161	57	0.0092
Planting 8	0.13	10.8	1.4040	66	0.9266	0.43	0.0559	77	0.0430	0.07	0.0091	57	0.0052
Planting 9	0.13	10.8	1.4040	66	0.9266	0.43	0.0559	77	0.0430	0.07	0.0091	57	0.0052
Total:	**16.2**		**174.9600**		**115.4736**		**6.9660**		**5.3638**		**1.1340**		**0.6464**

Streambank Regeneration – South Branch Patapsco Watershed

Location	Linear Feet	TN lbs reduced/linear ft	TN Pollutant Loads Reduced (lbs)	TP lbs reduced/linear ft	TP Pollutant Loads Reduced (lbs)	TSS lbs reduced/linear ft	TSS Pollutant Loads Reduced (lbs)	TSS Pollutant Loads Reduced (Tons)
Carroltonwe 2A	1100	0.075	82.500	0.068	74.800	44.8	49280	24.640
Eledersburg Estates 3-5	600	0.075	45.000	0.068	40.800	44.8	26880	13.440

Stormwater Facility Impervious Treatment– South Branch Patapsco Watershed

Project	Project Type	Drainage Area (Ac)	Impervious Area (Acres)	Practice Type	Runoff depth treated (In.)	TN Pollutant Runoff Load	Total Loads (lbs)	TN BMP Efficiency (%)	TN Pollutant Loads Reduced (lbs)	TP Pollutant Load	Total Loads (lbs)	TP BMP Efficiency	TP Pollutant Loads Reduced (lbs)	TSS Pollutant Load	Total Loads (tons)	TSS BMP Efficiency	TSS Pollutant Loads Reduced (Tons)
Arthurs Ridge	Retrofit	51.17	5.14	ST	2.13	15.3	78.6420	39%	30.7707	1.69	8.6866	62%	5.3487	0.44	2.2616	78%	1.7715
South Carroll High-Fine Arts	New constructi on	24.22	12.94	RR	1.00	15.3	197.9820	60%	118.2942	1.69	21.8686	70%	15.2862	0.44	5.6936	75%	4.2651
Brimfield	Retrofit	34.69	9.15	RR	2.50	15.3	139.9950	68%	94.7766	1.69	15.4635	79%	12.1871	0.44	4.0260	85%	3.4180
Harvest Farms 1A	Retrofit	43.8	11.25	ST	1.00	15.3	172.1250	35%	60.1577	1.69	19.0125	55%	10.4417	0.44	4.9500	70%	3.4601
Parrish Park	Retrofit	94.23	18.2	ST	1.00	15.3	278.4600	35%	97.3218	1.69	30.7580	55%	16.8923	0.44	8.0080	70%	5.5976
Clipper Hills Gardenia	Retrofit	33.19	11.08	ST	2.50	15.3	169.5240	39%	66.6484	1.69	18.7252	62%	11.6091	0.44	4.8752	79%	3.8422
Clipper hills Hilltop	Retrofit	80.17	18.54	ST	2.50	15.3	283.6620	39%	111.5217	1.69	31.3326	62%	19.4253	0.44	8.1576	79%	6.4292
Carroltowne 2B	Retrofit	34.61	10.38	ST	2.50	15.3	158.8140	39%	62.4377	1.69	17.5422	62%	10.8757	0.44	4.5672	79%	3.5995
Carroltowne 2A	Retrofit	87.73	34.43	ST	2.49	15.3	526.7790	39%	207.0259	1.69	58.1867	62%	36.0580	0.44	15.1492	79%	11.9343
Benjamins Claim	Retrofit	47.1	15.78	ST	2.21	15.3	241.4340	39%	94.5156	1.69	26.6682	62%	16.4347	0.44	6.9432	78%	5.4426
Eldersburg Estates 3-5	Retrofit	34.91	8.16	ST	2.50	15.3	124.8480	39%	49.0840	1.69	13.7904	62%	8.5497	0.44	3.5904	79%	2.8297
Braddock Manor West	Retrofit	49.3	7.65	ST	2.50	15.3	117.0450	39%	46.0162	1.69	12.9285	62%	8.0153	0.44	3.3660	79%	2.6528
Benjamins Claim Basin B	Retrofit	1.33	0.55	ST	1.04	15.3	8.4150	35%	2.9721	1.69	0.9295	56%	0.5159	0.44	0.2420	71%	0.1709
Hawks Ridge	Retrofit	63.48	19.8	ST	0.60	15.3	302.9400	29%	87.1455	1.69	33.4620	45%	15.1268	0.44	8.7120	58%	5.0128

Stormwater Facility Pervious Treatment– South Branch Patapsco Watershed

Project	Project Type	Drainage Area (Ac)	Pervious Area (Ac)	Practice Type	Runoff depth treated (In.)	TN Pollutant Runoff Load	Total Loads (lbs)	TN BMP Efficiency (%)	TN Pollutant Loads Reduced (lbs)	TP Pollutant Load	Total Loads (lbs)	TP BMP Efficiency	TP Pollutant Loads Reduced (lbs)	TSS Pollutant Load	Total Loads (tons)	TSS BMP Efficiency	TSS Pollutant Loads Reduced (Tons)
Arthurs Ridge	Retrofit	51.17	46.03	ST	2.13	10.8	497.1240	39%	194.5127	0.43	19.7929	62%	12.1873	0.07	3.2221	78%	2.5238
South Carroll High-Fine Arts	New constructi on	24.22	11.28	RR	1.00	10.8	121.8240	60%	72.7898	0.43	4.8504	70%	3.3904	0.07	0.7896	75%	0.5915
Brimfield	Retrofit	34.69	25.54	RR	2.50	10.8	275.8320	68%	186.7383	0.43	10.9822	79%	8.6553	0.07	1.7878	85%	1.5178
Harvest Farms 1A	Retrofit	43.8	32.55	ST	1.00	10.8	351.5400	35%	122.8632	0.43	13.9965	55%	7.6869	0.07	2.2785	70%	1.5927
Parrish Park	Retrofit	94.23	76.03	ST	1.00	10.8	821.1240	35%	286.9828	0.43	32.6929	55%	17.9549	0.07	5.3221	70%	3.7201
Clipper Hills Gardenia	Retrofit	33.19	22.11	ST	2.50	10.8	238.7880	39%	93.8795	0.43	9.5073	62%	5.8943	0.07	1.5477	79%	1.2198
Clipper hills Hilltop	Retrofit	80.17	61.63	ST	2.50	10.8	665.6040	39%	261.6822	0.43	26.5009	62%	16.4298	0.07	4.3141	79%	3.4000
Carroltowne 2B	Retrofit	34.61	24.23	ST	2.50	10.8	261.6840	39%	102.8811	0.43	10.4189	62%	6.4594	0.07	1.6961	79%	1.3367
Carroltowne 2A	Retrofit	87.73	53.3	ST	2.49	10.8	575.6400	39%	226.2284	0.43	22.9190	62%	14.2028	0.07	3.7310	79%	2.9392
Benjamins Claim	Retrofit	47.1	31.32	ST	2.21	10.8	338.2560	39%	132.4190	0.43	13.4676	62%	8.2996	0.07	2.1924	78%	1.7186
Eldersburg Estates 3-5	Retrofit	34.91	26.75	ST	2.50	10.8	288.9000	39%	113.5810	0.43	11.5025	62%	7.1312	0.07	1.8725	79%	1.4758
Braddock Manor West	Retrofit	49.3	41.65	ST	2.50	10.8	449.8200	39%	176.8467	0.43	17.9095	62%	11.1034	0.07	2.9155	79%	2.2978
Benjamins Claim Basin B	Retrofit	1.33	0.78	ST	1.04	10.8	8.4240	35%	2.9753	0.43	0.3354	56%	0.1861	0.07	0.0546	71%	0.0386
Hawks Ridge	Retrofit	63.48	43.68	ST	0.60	10.8	471.7440	29%	135.7047	0.43	18.7824	45%	8.4908	0.07	3.0576	58%	1.7593

Chesapeake Bay TMDL
Restoration Progress – Nitrogen

CB Segment Shed	Jurisdiction	% Reduction Required	Required Bay Reduction (Lbs.)	TN EOS (Local) Loads Reduced (lbs.) FY18[1]	TN Bay Loads Reduced (Lbs.) FY18[1]	% Bay TMDL Met FY18	TN EOS (Local) Loads Reduced (lbs.) FY19[1]	TN Bay Loads Reduced (Lbs.) FY19[1]	% Bay TMDL Met FY19
Potomac	County	9.50%	6,070.25	2,021.28	528.03	**5.16%**	2,389.49	620.64	**6.07%**
	Municipal	8.90%	4,162.01						
			10,232.26						
Gunpowder	County	9.90%	190.58	622.40	33.87	**8.81%**	654.18	37.92	**9.86%**
	Municipal	9.30%	193.97						
			384.55						
Patapsco	County	14.00%	1,785.75	18,006.70	933.00	**42.17%**	19,896.14	999.86	**45.19%**
	Municipal	13.00%	426.84						
			2,212.59						

Chesapeake Bay TMDL
Restoration Progress – Phosphorus

CB Segment Shed	Jurisdiction	% Reduction Required	Required Bay Reduction (Lbs.)	TP EOS (Local) Loads Reduced (lbs.) FY18[1]	TP Bay Loads Reduced (Lbs.) FY18[1]	% Bay TMDL Met FY18	TP EOS (Local) Loads Reduced (lbs.) FY19[1]	TP Bay Loads Reduced (Lbs.) FY19[1]	% Bay TMDL Met FY19
Potomac	County	23.10%	1,284.97	211.17	99.25	**4.45%**	249.51	117.27	**5.26%**
	Municipal	20.80%	943.98						
			2,228.95						
Gunpowder	County	15.70%	20.00	52.00	6.96	**12.84%**	75.82	11.37	**20.97%**
	Municipal	18.20%	34.21						
			54.21						
Patapsco	County	36.10%	481.49	1,642.50	138.93	**22.48%**	1,809.76	150.03	**24.28%**
	Municipal	32.60%	136.51						
			618.00						

Local TMDL Restoration Progress-Phosphorus
Completed Projects Through end of FY listed

Watershed	% Reduction Required	% Reduction Achieved FY17	% TMDL Met FY17	% Reduction Achieved FY18	% TMDL Met FY18
Double Pipe Creek	72.5%	1.2%	1.6%	1.8%	2.5%
Liberty Reservoir	50.0%	4.8%	9.6%	12.8%	25.6%
Loch Raven	15.0%	29.3%	195.0%	26.1%	174.0%
Lower Monocacy	30.0%	<1%	1.7%	<1%	1.7%
Prettyboy Reservoir	15.0%	1.8%	12.0%	1.7%	11.3%
Upper Monocacy	5.0%	1.0%	20.0%	1.0%	20.0%

Local TMDL Restoration Progress-Sediment
Completed Projects Through end of FY listed

Watershed	% Reduction Required	% Reduction Achieved FY 17	% TMDL Met FY17	% Reduction Achieved FY18	% TMDL Met FY18
Double Pipe Creek	33.8%	1.90%	5.60%	3.10%	9.20%
Liberty Reservoir	37.0%	5.70%	15.40%	9.90%	26.80%
Loch Raven	n/a	n/a	n/a	n/a	n/a
Lower Monocacy	n/a	n/a	n/a	n/a	n/a
Prettyboy Reservoir	n/a	n/a	n/a	n/a	n/a
Upper Monocacy	43.5%	1.7%	3.8%	1.7%	3.9%

Appendix G

Discrepancies Between Documentation and the Geodatabase Design

Carroll County maintains a MS4 geodatabase throughout the permit year. This geodatabase contains data specifically requested by MDE and additional data that Carroll County staff and personnel have determined is useful to conduct operations. At the conclusion of the permit year, the data contained within the County's geodatabase is migrated to the geodatabase designed by MDE. This is done to abide by the format MDE requires that the data be submitted in and to filter out any extraneous data used only by the County. During the process of migrating data from the County database to the MDE database, a variety of errors were found in the Maryland Department of the Environment's *National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4), Geodatabase Design and User's Guide* and MDE's geodatabase design. A handful of these errors have been brought to MDE's attention previously but remain. Carroll County would like to make note of these errors in hopes that they are corrected as soon as possible. Some of the errors resulted in inaccurate data being submitted, through no fault of our own, as well as lengthy work-around processes that required staff time and resources to implement.

Additionally, indications are that the geodatabase format as described in the documentation will be integrated with the County's next NPDES permit. The County requests that not only these issues be addressed, but follow-up with other discussed schema issues and changes be addressed before finalization of the next permit.

Below, each associated table and feature class contained within MDE's geodatabase and any issues or errors found during the submission process are outlined.

1. PermitInfo, Associated Table

The documentation states that the FEDERAL_NUM field requires a 10 digit federal permit number. The Carroll County federal permit number is MD0068331, which is only 9 digits. To avoid confusion, the documentation should be adjusted.

2. Outfall, Feature Class

It is required that a construction year be provided for each outfall in this feature class. Some of the outfalls that are contained in this feature class pre-date records being kept. If the year of construction is known, then that attribute is populated, otherwise the year is estimated from nearby property as-built years when possible. Any unknown built-years are populated with 9999 to meet the requirement of providing a value, but acknowledging that the value is not known. It is unclear why this information is required by MDE or what use this information has in the submitted geodatabase. Populating this attribute for some outfalls would require resources and time beyond what is reasonable for an attribute with little use and no justification.

3. OutfallDrainage Area, Feature Class

No issues found at this time.

4. BMPPOI, Feature Class

No issues found at this time.

5. BMP, Associated Table

In the MDE provided user's guide, the ON_OFF_SITE field is noted as being optional. During meetings with MDE, it was agreed that this field has no value and in the future should be removed from the database schema. However, the schema in the geodatabase lists this field as mandatory and requires it be populated in order for the data to be loaded. We populated this field with accurate data for submittal. In this instance, the geodatabase's schema needs to be corrected.

The APPR_DATE is noted as being mandatory in the user's guide while the schema in the geodatabase allows for null values. Similarly, the data type that populates this field should be a date according to the user's guide, but the geodatabase's schema requires a double data type. This is an error with the geodatabase's schema that needs to be corrected. The information has been provided, as the user's guide requests, in the double data type required by the geodatabase's schema to avoid making edits to MDE's geodatabase schema. To submit the data in double format, the data was exported from ArcMap into Excel. There, each date was converted to a general number. After this process, data was then moved into a personal geodatabase. This data was joined to existing data. The personal geodatabase had a table that mimicked the required table to avoid directly editing MDE's geodatabase or the County's correctly maintained data. The field calculator was then used to individually populate fields. Lastly, the data load was completed from this table into MDE's geodatabase. Because our data is stored in the correct Date/Time format, this work around was especially time consuming and problematic. Determining the appropriate work around that would ultimately provide MDE with the required data took nearly an entire day of work for one employee along with time contributed from other employees that aided in solving the problem. Viewing a piece of data meant to be a date as a general number doesn't provide MDE with easily interpreted, useful data and wasted employee efforts and taxpayer money.

Address, City, State, and Zip are coded as mandatory fields. There are process based issues with populating these attributes for features that may not have physical addresses, or may be collections of ESD BMPs. MDE has directed the County to pick addresses that make the most sense for the administration of the program. However, the County does not feel that addresses provide any value to the administration of our program. For this submission, we populated the fields through a spatial join to the closest address point feature class. The fields are populated, but we advise caution in their use. We recommend that MDE allow these attributes to be optional, or remove them altogether.

6. BMPDrainageArea, Feature Class

The BMPPOI_ID attribute is noted as being mandatory in the user's guide. However, the schema in the geodatabase allows for null values. This makes the data optional. The geodatabase's schema needs to be corrected.

7. ImperviousSurface, Associated Table

No issues found at this time.

8. MonitoringSite, Feature Class

No issues found at this time.

9. MonitoringDrainageArea, Feature Class

No issues found at this time.

10. AltBMPLine, Feature Class

The IMPL_COST field only exists in the user's guide and doesn't at all exist in the geodatabase. This field should be added. This field is indicated as being a short integer data type. Short integer data types are limited to values ranging from -32,768 to 32,768. This would prevent us from entering any project costs above $32,768. This data type should be changed to a long integer type. This problem exists in other tables and feature classes within the geodatabase and has been noted to MDE before this submission with no changes having been made to date. It is imperative that this be updated so that accurate project costs can be loaded into MDE's geodatabase and submitted. Because the field doesn't exist in the geodatabase but is noted as being mandatory, the data that would normally reside in this field can be found in general comments so that it could be submitted and compliance attained.

The field PROJECTED_IMPL_YR is noted in the user's guide as being a conditional piece of data. However, the schema of the database makes this a mandatory data point and does not allow for null values to be submitted. Because some projects are completed, and thus don't have a projected implementation year, a work around was required to populate this mandatory field. Projected years are listed for projects that are indicated as 'in planning' or 'under construction' and actual implementation years are entered for projects that have been completed. The geodatabase's schema needs to be corrected to allow null values.

The TP_LOAD, TN_LOAD, TSS_REDUCATION, TP_REDUCATION, and TN_REDUCTION fields are noted in the user's guide as being a conditional piece of data. However, the schema of the database requires that these fields be populated and does not allow for null values. For this reason, we populated these fields with 999 to allow for data to be loaded. MDE's stormwater waste load allocation manual states that outfall restoration does not receive any pollutant removal credit so it can't be a mandatory field. The geodatabase's schema needs to be corrected to allow null values.

The BMP_DRAIN_AREA, PROJECT_CITY, PROJECT_STATE, PROJECT_ZIP, and LU_COUNTY fields are noted as being optional in the user's guide. However, the schema of the database require that these fields be populated and does not allow for null values. This data was entered to allow for data to load and to avoid editing MDE's geodatabase, but we are requesting that the schema or user's guide be corrected moving forward.

11. StrRestProtocols, Associated Table

No issues found at this time.

12. ShorelineManagementPractices, Associated Table

No issues found at this time.

13. AltBMPPoint, Feature Class

The PROJECT_ADDRESS field is noted as being an optional field in the user's guide. However, the geodatabase's schema requires this field be populated.

IMPL_COST field is indicated as being a short integer data type in the user's guide. This prevents us from entering any project costs above $32,768. This data type should be changed to a long integer type. This problem exists in other tables and feature classes within the geodatabase and has been noted to MDE before this with no changes having been made to date. It is imperative that this be updated so that accurate project costs can be loaded into MDE's geodatabase. In the meantime, any implementation costs $32,000 or lower are accurately entered. Any projects with costs above $32,000 were rounded down to $32,000 to allow for submission of data. However, because data is accurately stored in Carroll County's geodatabase, additional steps to alter the data in personal geodatabases were required to accomplish this task. This required employee time, effort, and resources only to provide incorrect information.

The County receives impervious treatment credit for septic pumping, which is recorded in the AltBMPPoint feature class. The documentation states that this feature class is only for septic upgrades, which is incorrect.

14. AltBMPPoly, Feature Class

IMPL_COST field is indicated as being a short integer data type in the user's guide. This prevents us from entering any project costs above $32,768. This data type should be changed to a long integer type. This problem exists in other tables and feature classes within the geodatabase and has been noted to MDE before this with no changes having been made to date. It is imperative that this be updated so that accurate project costs can be loaded into MDE's geodatabase. In the meantime, any implementation costs $32,000 or lower are accurately entered. Any projects with costs above $32,000 were rounded down to $32,000 to allow for submission of data. However, because data is accurately stored in Carroll County's geodatabase, additional steps to alter the data in personal geodatabases were required to accomplish this task. This required employee time, effort, and resources only to provide incorrect information.

The PROJECT_CITY and PROJECT_ZIP fields are noted as being optional in the user's guide. However, the geodatabase's schema requires these fields be populated.

The field PROJECTED_IMPL_YR is noted in the user's guide as being a conditional piece of data. However, the schema of the database makes this a mandatory data point and does not allow

for null values to be submitted. Because some projects are completed, and thus don't have a projected implementation year, a work around was required to populate this mandatory field. Projected years are listed for projects that are indicated as in planning or under construction and actual implementation years are entered for projects that have been completed. The geodatabase's schema needs to be corrected to allow null values.

In the user's guide, the PERMIT_NUM field appears twice in the table outlining the feature class attributes. Also, this feature class is missing from the table of contents in the user's guide.

The ACRES_Planted field is a short integer field. MDE has indicated that values of less than an acre should not be rounded up to 1 acre. This is not acceptable as credit should be recognized for smaller planting sites. This field should be changed to double, or acreages should be allowed to be rounded up.

15. RestBMP, Feature Class

IMPL_COST field is indicated as being a short integer data type in the user's guide. This prevents us from entering any project costs above $32,768. This data type should be changed to a long integer type. This problem exists in other tables and feature classes within the geodatabase and has been noted to MDE before this with no changes having been made to date. It is imperative that this be updated so that accurate project costs can be loaded into MDE's geodatabase. In the meantime, any implementation costs $32,000 or lower are accurately entered. Any projects with costs above $32,000 were rounded down to $32,000 to allow for submission of data. However, because data is accurately stored in Carroll County's geodatabase, additional steps to alter the data in personal geodatabases were required to accomplish this task. This required employee time, effort, and resources only to provide incorrect information.

The field PROJECTED_IMPL_YR is noted in the user's guide as being a conditional piece of data. However, the schema of the database makes this a mandatory data point and does not allow for null values to be submitted. Because some projects are completed, and thus don't have a projected implementation year, a work around was required to populate this mandatory field. Projected years are listed for projects that are indicated as in planning or under construction and actual implementation years are entered for projects that have been completed. The geodatabase's schema needs to be corrected to allow null values.

The BMPPOI_ID and BMP_DRAIN_ID fields are noted as being mandatory in the user's guide provided by MDE. However, the schema in the geodatabase allows for null values. The geodatabase schema needs to be corrected. We provided the information, as the user's guide requests.

Impervious area is the metric that is being used to track our permit. The amount we have, the amount we treated, and the amount we are working to treat. In the Alternative BMP features, there is a field for EQU_IMP_ACR, which states the equivalent impervious area treated. When we perform retrofit projects, we can achieve extra credit for treating more than 1" of rainfall. To accurately account for the impervious area treated, there should be a similar EQU_IMP_ACR field in this feature class.

16. SWM, Associated Table

No issues found at this time.

17. BMPInspections, Associated Table

The REINSP_STATUS and REINSP_DATE fields are noted in the user's guide as being optional. However, in MDE's geodatabase, the properties state that these fields cannot contain null values. Despite this, a data load was successful without having populated these fields. While this is not a current issue, it could become one in the future. The REINSP_STATUS and REINSP_DATE fields' schema should allow for null values. Complete removal of these fields as a schema change has been discussed with MDE.

18. AltBMPLineInspections, Associated Table

The REINSP_STATUS and REINSP_DATE fields are noted in the user's guide as being optional. However, in MDE's geodatabase, the schema in the geodatabase does not allow null values. In order to complete a data load, the REINSP_STATUS fields were set to Pass and the REINSP_DATE was entered as 9/9/9999. Carroll County creates a new inspection record for each inspection, including reinspections. This allows the capture of every single inspection instead of just the initial and final inspections. In the case of a BMP that requires reinspection multiple times, using MDE's methodology would lead to any inspections between the initial and final inspections being lost. Carroll County's method allows you to easily see every inspection record by BMP ID beyond just the initial and final. The REINSP_STATUS and REINSP_DATE fields' schema should allow for null values. Complete removal of these fields as a schema change has been discussed with MDE.

19. AltBMPPointInspections, Associated Table

There are three types of AltBMPPoints, Septic connections to WWTP, Septic Denitrification, and Septic Pumping. The only one that is conducive to having inspections performed is septic denitrification. This BMP is achieved by implementing BAT technology on septic systems, which is then inspected by MDE on an annual basis. The data records obtained from MDE for these inspections were not easily relatable to the installations. A significant amount of time was spent conflating the data. Is there merit to spending considerable amounts of time to report inspections performed by MDE back to MDE? This table should be deleted. If the table is kept, proper guidance regarding protocols should be included.

The REINSP_STATUS and REINSP_DATE fields are noted in the user's guide as being optional. However, in MDE's geodatabase, the schema in the geodatabase does not allow null values. In order to complete a data load, the REINSP_STATUS fields were set to Pass and the REINSP_DATE was entered as 9/9/9999. Carroll County creates a new inspection record for each inspection, including reinspections. This allows the capture of every single inspection instead of just the initial and final inspection. In the case of a BMP that requires reinspection multiple times, using MDE's methodology would lead to any inspections between the initial and final inspections being lost. Carroll County's method allows you to easily see every inspection

record by BMP ID beyond just the initial and final. The REINSP_STATUS and REINSP_DATE fields' schema should allow for null values. Complete removal of these fields as a schema change has been discussed with MDE.

20. AltBMPPolyInspections, Associated Table

The REINSP_STATUS and REINSP_DATE fields are noted in the user's guide as being optional. However, in MDE's geodatabase, the schema in the geodatabase does not allow null values. In order to complete a data load, the REINSP_STATUS fields were set to Pass and the REINSP_DATE was entered as 9/9/9999. Carroll County creates a new inspection record for each inspection, including reinspections. This allows the capture of every single inspection instead of just the initial and final inspection. In the case of a BMP that requires reinspection multiple times, using MDE's methodology would lead to any inspections between the initial and final inspections being lost. Carroll County's method allows you to easily see every inspection record by BMP ID beyond just the initial and final. The REINSP_STATUS and REINSP_DATE fields' schema should allow for null values. Complete removal of these fields as a schema change has been discussed with MDE.

21. RestBMPInspections, Associated Table

The REINSP_STATUS and REINSP_DATE fields are noted in the user's guide as being optional. However, in MDE's geodatabase, the properties state that these fields cannot contain null values. Despite this, a data load was successful without having populated these fields. While this is not a current issue, it could become one in the future. The REINSP_STATUS and REINSP_DATE fields' schema should allow for null values. Complete removal of these fields as a schema change has been discussed with MDE.

22. ErosionSedimentControl, Associated Table

No issues found at this time.

23. QuarterlyGradingPermits, Feature Class

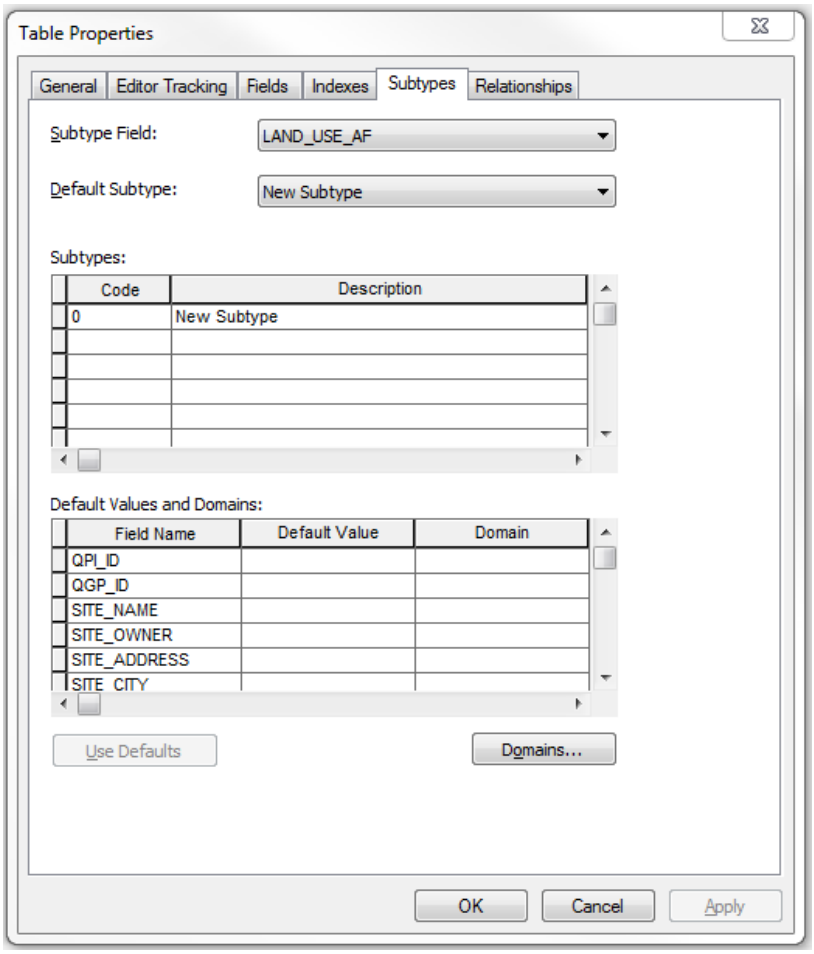
The PERMIT_NUM field is noted in the user's guide as being a mandatory data point. However, the schema in the geodatabase allows for null values. Every other table and feature class within MDE's geodatabase has this field as mandatory. This is an error with the geodatabase's schema that needs to be corrected.

There is no field for reporting year as there is with every other table or feature class (REPORTING_YEAR). Nearly every other table and feature class within MDE's geodatabase has this field as mandatory. This is an error with the geodatabase's schema that needs to be corrected.

24. QuarterlyGradingPmtInfo, Associated Table

In the geodatabase user's guide, LAND_USE_BF, LU_COUNTY_BF, LAND_USE_AF, and LU_COUNTY_AF are noted as being mandatory. However, LU_COUNTY_BF and LAND_USE_AF both allow for null values to be entered in the geodatabase. Because the user's guide dictates that these attributes are mandatory, the information was supplied. Carroll County would like to request that MDE explain what benefit this information provides to MDE. Providing this information is labor intensive and requires more effort than benefit. Carroll County believes this information should be optionally provided.

When the data load was attempted, the LAND_USE_AF field would not populate. If individual records were attempted to be changed after the load, changing this field would cause unintended and unwanted changes to other fields within the record. After looking through the schema and properties of the table, an option under the Subtypes tab in the table properties showed a New Subtype for this field. This is preventing this field from being populated. An image of the table's properties is provided to illustrate the issue. To solve this problem, we are utilizing the QuarterlyGradingPmtInfo associated table from MDE's geodatabase provided in 2015. In this older version, the issue with the LAND_USE_AF is not present. The major differences are seen in the 2015 table allowing more fields to contain null values than the 2017 table. Care has been taken to provide all mandatory information as outlined in the user's guide despite these fields allowing null values. Again, this problem required the time and effort of three separate employees that spanned several days to determine what was causing the data to not load correctly. Issues like this and several others mentioned waste valuable time and taxpayer money that could be better spent.



25. RespPersonnelCertInfo, Associated Table

Almost every field in this table is noted in the user's guide as being optional. However, the geodatabase's schema doesn't allow for null values. Despite this, a data load was successful without having populated these fields. While this is not a current issue, it could become one in the future. MDE instructed Carroll County to populate this table with a single blank record, which was done. As this information is managed by MDE and there is no requirement for the County to populate any data, it is recommended that this table be removed from the schema.

26. IDDE, Associated Table

No issues found at this time.

27. MunicipalFacilities, Feature Class

The QUARTER field is indicated as being mandatory in the user's guide. However, this field accepts null values. Carroll County provided this information as it was listed as mandatory in the user's guide. This is an error that needs to be corrected with the geodatabase's schema.

There is no field for reporting year as there is with every other table or feature class (REPORTING_YEAR). Nearly every other table and feature class within MDE's geodatabase has this field as mandatory. This is an error with the geodatabase's schema that needs to be corrected.

28. ChemicalApplication, Associated Table

The user's guide states that the field CHEM_AM_UNITS is a double data type. However, the geodatabase stores this data as a text string. In this instance we think the documentation is incorrect and should be corrected to agree with the schema present in the geodatabase currently.

29. CountywideStormwaterWatershedAssessment, Associated Table

No issues found at this time.

30. LocalStormwaterWatershedAssessment, Associated Table

No issues found at this time.

31. ChemicalMonitoring, Associated Table

No issues found at this time.

32. LocalConcern, Associated Table

No issues found at this time.

33. Biological Monitoring, Associated Table

Per MDE's user's guide, the FIBI field is optional. However, when loading our data into MDE's geodatabase, the schema dictates that this field be populated. Part IV.F.1.b. of Carroll County's MS4 permit designates the minimum requirements for biological monitoring as part of discharge characterization. It requires that we take benthic macroinvertebrate samples somewhere between the outfall and instream monitoring stations. Carroll County samples just downstream of the outfall station and at the instream station according to MBSS methods. To allow for data to be uploaded, the value 999 was entered into the field to prevent an error stopping the load process. The geodatabase's schema needs to be corrected.

The QUAL_DESCRIP and HABITAT_DESCRIP fields are noted in the user's guide as being conditional and the HABITAT field is noted as optional. However, the geodatabase requires that these fields be populated. In these instances, we had data for each of these fields so there was no load error, but we believe that the geodatabase's schema needs to be corrected to actually allow these fields to be conditional or optional and allow for null values when necessary.

The EVENT_DATE field is listed as mandatory in the user's guide, however the geodatabase allows for null values. This is an error that needs to be corrected with the geodatabase's schema.

34. FiscalAnalyses, Associated Table

No issues found at this time.

35. NarrativeFiles, Associated Table

The MON_STATION_ID field is noted as being optional in the user's guide. However, the geodatabase's schema requires this field be populated. This field was populated with 999 to allow the data to load. The geodatabase's schema needs to be corrected.